

Exposure Point Concentrations Based on Future Concentrations of Final COPCs of the 200- PO-1 Groundwater Operable Unit

Prepared for the U.S. Department of Energy
Assistant Secretary for Environmental Management

Contractor for the U.S. Department of Energy
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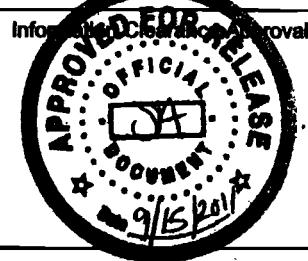
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Terms

CERCLA	<i>Comprehensive Environmental Response, Compensation, and Liability Act of 1980</i>
Cmax	maximum concentration value
COPC	contaminant of potential concern
ECF	environmental calculation file
EPA	U.S. Environmental Protection Agency
EPC	exposure point concentration
RI	Remedial Investigation
RI/FS	Remedial Investigation/Feasibility Study
OU	Operable Unit

1 Purpose

This environmental calculation file (ECF) describes the calculation of exposure point concentrations (EPCs) based on future groundwater calculation results for the final contaminants of potential concern (COPCs) in the near-field and far-field exposure areas of the 200-PO-1 Groundwater Operable Unit (OU). The values used in the EPA calculations are from the 1,000 year fate and transport simulation time period. To determine the approximate timeframe for when cleanup levels are attained, future groundwater concentrations are calculated at 25-year intervals up to a total of 200 years and at 100-year intervals thereafter for each location and each final COPC. The EPCs for the final COPCs are compared to applicable actions levels to determine if current groundwater concentrations will naturally attenuate to acceptable levels over the 1,000 year fate and transport time frame. This ECF details the methodology implemented to calculate the EPCs. The selection of the final COPCs for the 200-PO-1 Groundwater OU is documented separately (ECF-200PO1-09-2018, *Contaminant of Potential Concern Selection for the 200-PO-1 Groundwater Operable Unit*).

This ECF supports the remedial investigation/feasibility study (RI/FS) process being conducted at the 200-PO-1 OU Groundwater OU under the *Comprehensive Environmental Response, Compensation, and Liability Act of 1980* (CERCLA). The process is currently at the RI stage of completion.

An EPC is an conservative estimate of the contaminant concentration at an exposure point where an exposed receptor may reasonably be assumed to move at random and where contact with an environmental medium (e.g., water) is equally likely at all sub-locations. The U.S. Environmental Protection Agency (EPA) *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A)* (EPA/540/1-89/009) defines the exposure concentration as follows:

“Although this concentration does not reflect the maximum concentration that could be contacted at any one time, it is regarded as a reasonable estimate of the concentration likely to be contacted over time. This is because in most situations, assuming long-term contact with the maximum concentration is not reasonable.”

This ECF addresses a key element of the risk assessment process for hazardous waste sites: estimation of the concentration of a chemical in the environment.

2 Methodology and Inputs

The evaluation methodology involves processing an exposure area-specific data set to calculate EPCs and to identify the maximum projected concentrations that reflect future groundwater conditions for each of the final COPCs. The methodology used to simulate near-field groundwater conditions differs from the methodology used for the far-field.

2.1 Near-field Methodology

The groundwater concentrations in the near-field exposure area are simulated using the Central Plateau model. The Central Plateau model predicts groundwater concentrations to that portion of the 200-PO-1 Groundwater OU that falls within the model domain. This portion of the OU incorporates what is called the “near-field” portion of the 200-PO-1 Groundwater OU (i.e., that portion of the OU that lies beneath and/or immediately downgradient of the known, or suspected, sources of contamination) and extends part way into the “far-field” portion of the 200-PO-1 Groundwater OU. Of the 83 wells in the near-field area, 66 wells were reported with concentrations of one or more final COPCs above their action level. A subset

of 21 wells were selected to represent contamination within the near-field exposure area, these wells are listed in Table 2-1.

Groundwater concentrations for each final COPC were calculated at 25-year intervals up to a total of 200 years and at 100-year intervals thereafter were calculated at the 21 locations listed in Table 2-1. As a result of limitations of the fate and transport model (instability and bounds on lower concentrations) some of the final COPCs do not have projected concentrations to 1,000 years. Groundwater concentrations at some wells were calculated at several screened intervals during the same year, resulting in multiple concentrations predicted for the same well. For these instances, the highest predicted concentration for the well was used for the calculation of the EPC. Furthermore, a maximum predicted concentration that best represents the majority of near-field wells, labeled Cmax S1b, was calculated and included in the data set. The Central Plateau model was used to predict future concentrations of iodine-129, technetium-99, tritium, strontium-90, nitrate, trichloroethene, and uranium in the near-field. The computational basis for simulation of the fate and transport of contaminants in groundwater within the near-field portion of the affected aquifer associated with the 200-PO-1 Groundwater OU is documented separately (ECF-200PO1-09-2352, *200-PO-1 Remedial Investigation Report - Central Plateau Groundwater Fate and Transport Modeling*).

2.2 Far-field Methodology

The far-field portion of the 200-PO-1 Groundwater OU simulates contaminant transport in the area away from the Hanford Central Plateau (near field). The model extent and discretization is guided by the location of wells used in the risk assessment calculations and by the current spatial extent of the plumes. Of the 83 wells in the far-field and river areas, 69 wells were reported with concentrations of one or more final COPCs above their action level. A subset of 24 wells was selected to guide the discretization of the pipe pathways within the far-field exposure area, these wells are listed in Table 2-2.

The far-field exposure area (also represents river area) is subdivided into three pipe pathways (northeast direction, east-northeast direction, and east-southeast direction) for calculation purposes and within each of these pipe pathways, six spatially unique locations are identified for a total of 18 far-field locations. This includes data from eight stream tube locations without a currently existing corresponding well were included in the far field data set. In addition to the calculated stream tube data, maximum concentrations for each time step were calculated for all far-field and stream tube locations and were included in the final data set. These spatially unique locations are shown in Figure 4-2 of ECF-200PO1-09-2007, *200-PO-1 Operable Unit Remedial Investigation Report - Contaminant Fate and Transport Modeling in the Distal Portion of OU*. Groundwater concentrations for each final COPC were calculated at 25-year intervals up to a total of 200 years and at 100-year intervals thereafter at each of these 30 locations. As a result of limitations of the fate and transport model (instability and bounds on lower concentrations) some of the final COPCs do not have projected concentrations to 1,000 years. The pipe pathways described in ECF-200-PO1-09-2007 were used to predict future concentrations of tritium, iodine-129, and nitrate. The Central Plateau model described in ECF-200PO1-09-2352 was used to predict future concentrations of the chlorinated solvents near the solid waste landfill and the nonradioactive waste landfill (i.e. carbon tetrachloride, trichloroethene, and tetrachloroethene). Furthermore, calculated maximum concentrations for both far field and stream tube wells were calculated and included in the data set. The computational basis for simulation of the fate and transport of contaminants in groundwater within the “far-field” portion of the affected aquifer associated with the 200-PO-1 Groundwater Operable Unit is documented separately (ECF-200PO1-09-2007).

2.3 Maximum Concentration Values

For both the near field, far field, and stream tubes a maximum concentration value (Cmax) was Calculated. The Cmax value represents the calculated maximum projected concentration that occurs within the modeling zone at each time step and is not necessarily associated with a particular well. The modeling zones were grouped by geographic area. The Cmax for calculated zone S1b includes all of the near field wells as well as a subset of the far field wells, and was used in the calculation of both the near field and far field 90th percentile values. The Cmax for calculating zone S2 represents the remaining far field wells as well as select stream tube data and was used in the calculation of the far field 90th percentile values. Finally, a Cmax value was calculated for the stream tube data and was used in the calculation of the 90th percentile value in the far field. The associated wells within each area are presented in Table 2-3.

Table 2-1. Near-field Monitoring Wells Selected for Calculating Future Groundwater Concentrations

Well Name	Final COPC and Action Level						
	I-129 (1 pCi/L)	Tc-99 (900 pCi/L)	TCE (0.492 µg/L)	Tritium (20,000 pCi/L)	Sr-90 (8 pCi/L)	Uranium (30 µg/L)	Nitrate (45,000 µg/L)
299-E17-1	X	X	X	X	X	X	X
299-E17-14	X	X	X	X	X	X	X
299-E17-22	X	X	X	X	X	X	X
299-E17-23	X	X	X	X	X	X	X
299-E17-25	X	X	X	X	X	X	X
299-E24-16	X	X	X	X	X	X	X
299-E24-20	X	X	X	X	X	X	X
299-E24-23	X	X	X	X	X	X	X
299-E24-33	X	X	X	X	X	X	X
299-E25-19	X	X	X	X	X	X	X
299-E25-20	X	X	X	X	X	X	X
299-E25-3	X	X	X	X	X	X	X
299-E25-34	X	X	X	X	X	X	X
299-E25-36	X	X	X	X	X	X	X
299-E25-93	X	X	X	X	X	X	X
299-E26-4	X	X	X	X	X	X	X
699-37-47A	X	X	X	X	X	X	X
699-42-42B	X	X	X	X	X	X	X
699-43-44	X	X	X	X	X	X	X
699-43-45	X	X	X	X	X	X	X
699-45-42	X	X	X	X	X	X	X

Table 2-2. Far-field Monitoring Well Locations Selected for Calculating Future Groundwater Concentrations

Well Name	Final COPC and Action Level					
	I-129 (1 pCi/L)	Tritium (20,000 pCi/L)	Nitrate (45,000 µg/L)	Carbon Tetrachloride (0.23 µg/L)	PCE (0.081 µg/L)	TCE (0.492 µg/L)
699-20-20 ^a	X	X	X	X	X	X
699-20-12O ^a	X	X	X	X	X	X
699-20-E5A ^a	X	X	X	X	X	X
699-21-6 ^a	X	X	X	X	X	X
699-22-35	X	X	X	X	X	X
699-23-34A	X	X	X	X	X	X
699-24-33	X	X	X	X	X	X
699-24-34C	X	X	X	X	X	X
699-24-35	X	X	X	X	X	X
699-25-34A	X	X	X	X	X	X
699-25-34B	X	X	X	X	X	X
699-26-15A ^a	X	X	X	X	X	X
699-26-33	X	X	X	X	X	X
699-26-34A	X	X	X	X	X	X
699-26-35A ^a	X	X	X	X	X	X
699-29-4 ^a	X	X	X	X	X	X
699-31-11 ^a	X	X	X	X	X	X
699-32-22A ^a	X	X	X	X	X	X
699-32-43 ^a	X	X	X	X	X	X
699-34-42 ^a	X	X	X	X	X	X
699-35-9 ^a	X	X	X	X	X	X
699-37-E4 ^a	X	X	X	X	X	X
699-41-1A ^a	X	X	X	X	X	X
699-41-23 ^a						
NE-2 ^b	X	X	X	X	X	X
NE-4 ^b	X	X	X	X	X	X
NE-6 ^b	X	X	X	X	X	X
E-1 ^b	X	X	X	X	X	X
E-4 ^b	X	X	X	X	X	X

Table 2-1. Near-field Monitoring Wells Selected for Calculating Future Groundwater Concentrations

Well Name	Final COPC and Action Level						
	I-129 (1 pCi/L)	Tc-99 (900 pCi/L)	TCE (0.492 µg/L)	Tritium (20,000 pCi/L)	Sr-90 (8 pCi/L)	Uranium (30 µg/L)	Nitrate (45,000 µg/L)
E-5 ^b	X	X	X	X	X	X	X
SE-2 ^b	X	X	X	X	X	X	X
SE-6 ^b	X	X	X	X	X	X	X

^a Indicates well location was included in stream tube analysis.^b Indicates a stream tube location not currently associated with an existing well.

Table 2-3. Modeling Zone Associated Wells

Location	Well Number
Modeling Zone S1b	
NearField	299-E17-1
NearField	299-E17-14
NearField	299-E17-22
NearField	299-E17-23
NearField	299-E17-25
NearField	299-E24-16
NearField	299-E24-20
NearField	299-E24-23
NearField	299-E24-33
NearField	299-E25-19
NearField	299-E25-20
NearField	299-E25-3
NearField	299-E25-34
NearField	299-E25-36
NearField	299-E25-93
NearField	299-E26-4
FarField/RiverStreamTube	699-32-43
FarField/RiverStreamTube	699-34-42
NearField	699-37-47A
NearField	699-42-42B
NearField	699-43-44
NearField	699-43-45
NearField	699-45-42
Modeling Zone S2	
FarField/RiverStreamTube	699-22-35
FarField/RiverStreamTube	699-23-34A
FarField/RiverStreamTube	699-24-33
FarField/RiverStreamTube	699-24-34C
FarField/RiverStreamTube	699-24-35
FarField/RiverStreamTube	699-25-34A

Table 2-3. Modeling Zone Associated Wells

Location	Well Number
FarField/RiverStreamTube	699-25-34B
FarField/RiverStreamTube	699-26-33
FarField/RiverStreamTube	699-26-34A
FarField/RiverStreamTube	699-26-35A
Stream Tubes	
FarField/RiverStreamTube	E1 ^a
FarField/RiverStreamTube	699-26-15A
FarField/RiverStreamTube	699-29-4
FarField/RiverStreamTube	E4 ^a
FarField/RiverStreamTube	E5 ^a
FarField/RiverStreamTube	699-37-E4
FarField/RiverStreamTube	699-20-20
FarField/RiverStreamTube	SE2 ^a
FarField/RiverStreamTube	699-21-6
FarField/RiverStreamTube	699-20-E5A
FarField/RiverStreamTube	699-20-E12O
FarField/RiverStreamTube	SE6 ^a
FarField/RiverStreamTube	699-32-22A
FarField/RiverStreamTube	NE2 ^a
FarField/RiverStreamTube	699-35-9
FarField/RiverStreamTube	NE4 ^a
FarField/RiverStreamTube	699-41-1A
FarField/RiverStreamTube	NE6 ^a

^a Indicated stream tube location not currently associated with an existing well

3 Software Applications

Software used for this analysis includes Microsoft Excel which is used to calculate the 90th percentile concentrations and to present the groundwater data and information in spreadsheets. The software applications used to calculate the future concentrations of the final COPCs are documented separately (ECF-200PO1-09-2007 and ECF-200PO1-09-2352).

4 Calculation

The following subsections discuss the methodology used to determine the future EPC values based on predicted concentrations in the near-field and far-field exposure areas of the 200-PO-1 Groundwater OU.

4.1.1 Determination of the Statistical Calculation Method for EPC Values

The use of the 90th percentile from a distribution of groundwater concentration data as an exposure point concentration was established during the final COPC selection process for the 200-PO-1 Groundwater OU and is documented in ECF-200PO1-09-2027, *Calculation of Exposure Point Concentrations for the 200-PO-1 Groundwater Operable Unit*. The 90th percent calculation method is used, in conjunction with the calculated maximum concentration values, to calculate the EPC of predicted future groundwater concentrations to maintain consistency with the methodology used to calculate the EPCs based on historical groundwater sampling and analyses.

4.1.2 Calculation of the 90th Percentile Value

The 90th percentile value is the concentration that corresponds to the position in an ordered data set which has 90% of data points below it, and 10% above it. The 90th percentile value is calculated by first placing all sample results in order from the lowest concentration to the highest concentration. Next, assign each sample result a number, starting with the number 1 for the lowest concentration result up to the highest concentration being given the number equal to the total number of samples collected from a particular sampling location. The position corresponding to the 90th percentile is determined using the following equation:

$$k = \frac{p(n+1)}{100} \quad \text{where } p = 90 \text{ for a 90th percentile calculation} \\ n = \text{total number of samples}$$

If the number corresponding to the calculated value, k , is an integer, the sample result with rank corresponding to k is the 90th percentile value. If k is not an integer, then the average or mean of the values on either side of k (the values in the positions $k_{\text{rounddown}}$ and k_{roundup}) is calculated using the following equation to determine the 90th percentile value:

$$\text{90th percentile value} = \frac{k_{\text{rounddown}} \text{ value} + k_{\text{roundup}} \text{ value}}{2}$$

4.1.3 90th Percentile Values and Summary for the 200-PO-1 Groundwater OU Exposure Area Data Sets

The 90th percentile value calculations were performed for each of the final COPCs that have been identified for near-field and far-field exposure areas for each modeled time interval. The input data for the 90th percentile calculations are provided in Appendix A and Appendix B for the near-field and far-field exposure regions, respectively.

5 Results

The results of the 90th percentile calculations are summarized in Table 5-1 and Table 5-2 for the near-field and far-field exposure zones, respectively. The tables include the 90th percentile EPC result, the applicable action level and action level basis, and a determination of whether the EPC exceeded the action level. Hand calculations of the 90th percentile values are provided in Appendix C.

Table 5-1. Summary of Exposure Point Concentration Calculations and Action Level Exceedances for the Near-field Exposure Area

COPC	Year	Number of Detects	Number of Nondetects	Minimum Calculated	Maximum Calculated	Cmax	90 th Percentile	EPC Basis ⁽¹⁾	Exposure Point Concentration	Units	Action Level	Action Level Basis (Human Health & Aquatic Protection)	Cmax> Action Level?	EPC > Action Level?	Action Level	Action Level Basis (Human Health Protection Standards)	Cmax> Action Level?	EPC > Action Level?
Tritium	25	21	1	49	15,482	108,490	10,431	90th Percentile	10,431	pCi/L	20,000	Federal MCL	YES	NO	20,000	Federal MCL	YES	NO
	50	21	1	8.2	3,719	19,165	2,350	90th Percentile	2,350	pCi/L	20,000	Federal MCL	NO	NO	20,000	Federal MCL	NO	NO
	75	21	1	0.44	662	2,950	412	90th Percentile	412	pCi/L	20,000	Federal MCL	NO	NO	20,000	Federal MCL	NO	NO
	100	21	1	0.038	110	424	69	90th Percentile	69	pCi/L	20,000	Federal MCL	NO	NO	20,000	Federal MCL	NO	NO
	125	21	1	0.0043	19	66	12	90th Percentile	12	pCi/L	20,000	Federal MCL	NO	NO	20,000	Federal MCL	NO	NO
Iodine-129	25	21	1	0.032	2.9	4.3	2.5	90th Percentile	2.5	pCi/L	1	Federal MCL	YES	YES	1	Federal MCL	YES	YES
	50	21	1	0.12	2.7	3.7	2.3	90th Percentile	2.3	pCi/L	1	Federal MCL	YES	YES	1	Federal MCL	YES	YES
	75	21	1	0.050	2.4	3.2	2.0	90th Percentile	2.0	pCi/L	1	Federal MCL	YES	YES	1	Federal MCL	YES	YES
	100	21	1	0.017	2.1	2.8	1.7	90th Percentile	1.7	pCi/L	1	Federal MCL	YES	YES	1	Federal MCL	YES	YES
	125	21	1	0.0072	1.7	2.7	1.4	90th Percentile	1.4	pCi/L	1	Federal MCL	YES	YES	1	Federal MCL	YES	YES
	150	21	1	0.0042	1.4	2.6	1.1	90th Percentile	1.1	pCi/L	1	Federal MCL	YES	YES	1	Federal MCL	YES	YES
	175	21	1	0.0030	1.1	2.5	0.92	90th Percentile	0.92	pCi/L	1	Federal MCL	YES	NO	1	Federal MCL	YES	NO
	200	21	1	0.0025	0.89	2.3	0.74	90th Percentile	0.74	pCi/L	1	Federal MCL	YES	NO	1	Federal MCL	YES	NO
	300	21	1	7.00E-04	0.40	1.9	0.40	90th Percentile	0.40	pCi/L	1	Federal MCL	YES	NO	1	Federal MCL	YES	NO
	400	21	1	2.32E-04	0.40	2.7	0.35	90th Percentile	0.35	pCi/L	1	Federal MCL	YES	NO	1	Federal MCL	YES	NO
	500	21	1	1.19E-04	0.30	2.8	0.27	90th Percentile	0.27	pCi/L	1	Federal MCL	YES	NO	1	Federal MCL	YES	NO
	600	21	1	1.03E-04	0.29	1.7	0.25	90th Percentile	0.25	pCi/L	1	Federal MCL	YES	NO	1	Federal MCL	YES	NO
	700	21	1	1.26E-04	0.29	1.0	0.24	90th Percentile	0.24	pCi/L	1	Federal MCL	YES	NO	1	Federal MCL	YES	NO
	800	21	1	1.17E-04	0.27	1.1	0.23	90th Percentile	0.23	pCi/L	1	Federal MCL	YES	NO	1	Federal MCL	YES	NO
	900	21	1	1.60E-04	0.26	1.2	0.22	90th Percentile	0.22	pCi/L	1	Federal MCL	YES	NO	1	Federal MCL	YES	NO
	1000	21	1	2.35E-04	0.24	1.4	0.20	90th Percentile	0.20	pCi/L	1	Federal MCL	YES	NO	1	Federal MCL	YES	NO
Strontium-90	25	15	7	1.52E-43	0.16	5.2	0.090	90th Percentile	0.090	pCi/L	8	Federal MCL	NO	NO	8	Federal MCL	NO	NO
	50	17	5	9.50E-42	0.064	2.8	0.037	90th Percentile	0.037	pCi/L	8	Federal MCL	NO	NO	8	Federal MCL	NO	NO
	75	18	4	3.38E-37	0.025	1.5	0.014	90th Percentile	0.014	pCi/L	8	Federal MCL	NO	NO	8	Federal MCL	NO	NO
	100	20	2	8.05E-35	0.0096	0.81	0.0056	90th Percentile	0.0056	pCi/L	8	Federal MCL	NO	NO	8	Federal MCL	NO	NO
	125	19	3	2.52E-16	0.0040	0.44	0.0025	90th Percentile	0.0025	pCi/L	8	Federal MCL	NO	NO	8	Federal MCL	NO	NO
Technetium-99	25	21	1	2.35E-04	75	96	74	90th Percentile	74	pCi/L	900	Federal MCL	NO	NO	900	Federal MCL	NO	NO
	50	21	1	0.031	4.7	44	4.5	90th Percentile	4.5	pCi/L	900	Federal MCL	NO	NO	900	Federal MCL	NO	NO
	75	21	1	0.055	3.6	24	3.1	90th Percentile	3.1	pCi/L	900	Federal MCL	NO	NO	900	Federal MCL	NO	NO
	100	21	1	0.038	2.4	18	2.2	90th Percentile	2.2	pCi/L	900	Federal MCL	NO	NO	900	Federal MCL	NO	NO

Table 5-1. Summary of Exposure Point Concentration Calculations and Action Level Exceedances for the Near-field Exposure Area

COPC	Year	Number of Detects	Number of Nondetects	Minimum Calculated	Maximum Calculated	Cmax	90 th Percentile	EPC Basis ⁽¹⁾	Exposure Point Concentration	Units	Action Level	Action Level Basis (Human Health & Aquatic Protection)	Cmax>Action Level?	EPC > Action Level?	Action Level	Action Level Basis (Human Health Protection Standards)	Cmax>Action Level?	EPC > Action Level?
Uranium	125	21	1	0.028	2.5	14	2.2	90th Percentile	2.2	pCi/L	900	Federal MCL	NO	NO	900	Federal MCL	NO	NO
	25	19	3	2.59E-05	15	71	9.6	90th Percentile	9.6	µg/L	30	Federal MCL	YES	NO	30	Federal MCL	YES	NO
	50	21	1	1.13E-11	5.7	60	3.5	90th Percentile	3.5	µg/L	30	Federal MCL	YES	NO	30	Federal MCL	YES	NO
	75	20	2	1.01E-05	2.8	49	1.8	90th Percentile	1.8	µg/L	30	Federal MCL	YES	NO	30	Federal MCL	YES	NO
	100	20	2	1.04E-04	1.7	40	1.4	90th Percentile	1.4	µg/L	30	Federal MCL	YES	NO	30	Federal MCL	YES	NO
	125	20	2	3.81E-04	1.6	37	1.4	90th Percentile	1.4	µg/L	30	Federal MCL	YES	NO	30	Federal MCL	YES	NO
	150	20	2	8.07E-04	2.1	35	1.4	90th Percentile	1.4	µg/L	30	Federal MCL	YES	NO	30	Federal MCL	YES	NO
	175	20	2	0.0012	2.4	33	1.5	90th Percentile	1.5	µg/L	30	Federal MCL	YES	NO	30	Federal MCL	YES	NO
	200	21	1	9.62E-05	2.5	30	1.5	90th Percentile	1.5	µg/L	30	Federal MCL	YES	NO	30	Federal MCL	YES	NO
	300	21	1	0.0016	2.4	21	1.3	90th Percentile	1.3	µg/L	30	Federal MCL	NO	NO	30	Federal MCL	NO	NO
	400	21	1	0.0011	1.9	15	1.0	90th Percentile	1.0	µg/L	30	Federal MCL	NO	NO	30	Federal MCL	NO	NO
	500	21	1	6.73E-04	1.6	11	0.83	90th Percentile	0.83	µg/L	30	Federal MCL	NO	NO	30	Federal MCL	NO	NO
Nitrate	600	21	1	4.41E-04	1.3	7.6	0.76	90th Percentile	0.76	µg/L	30	Federal MCL	NO	NO	30	Federal MCL	NO	NO
	700	21	1	2.25E-04	1.0	6.7	0.75	90th Percentile	0.75	µg/L	30	Federal MCL	NO	NO	30	Federal MCL	NO	NO
	25	21	1	0.084	10,229	70,017	9,297	90th Percentile	9,297	µg/L	45000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO
	50	21	1	3.4	10,942	64,706	8,239	90th Percentile	8,239	µg/L	45000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO
	75	21	1	6.2	9,620	61,535	7,288	90th Percentile	7,288	µg/L	45000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO
	100	21	1	8.0	7,202	58,574	5,844	90th Percentile	5,844	µg/L	45000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO
	125	21	1	5.2	5,327	55,816	4,545	90th Percentile	4,545	µg/L	45000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO
	150	21	1	4.0	3,937	53,140	3,728	90th Percentile	3,728	pCi/L	45000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO
	175	21	1	3.2	3,893	50,541	3,531	90th Percentile	3,531	pCi/L	45000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO
	200	21	1	2.6	4,202	48,006	3,835	90th Percentile	3,835	pCi/L	45000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO
	300	21	1	1.2	4,157	38,535	3,800	90th Percentile	3,800	pCi/L	45000	Federal MCL	NO	NO	45,000	Federal MCL	NO	NO
	400	21	1	0.55	4,021	30,104	3,563	90th Percentile	3,563	pCi/L	45000	Federal MCL	NO	NO	45,000	Federal MCL	NO	NO
	500	11	11	0.21	3,417	22,951	3,056	90th Percentile	3,056	pCi/L	45000	Federal MCL	NO	NO	45,000	Federal MCL	NO	NO
Trichloro-ethene	600	7	15	76	2,718	23,490	2,427	90th Percentile	2,427	pCi/L	45000	Federal MCL	NO	NO	45,000	Federal MCL	NO	NO
	700	4	18	1,435	2,350	101,350	2,048	90th Percentile	2,048	pCi/L	45000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO
	25	21	1	9.50E-13	0.013	0.81	0.0096	90th Percentile	0.0096	µg/L	0.49	Groundwater Method B	YES	NO	0.49	Groundwater Method B	YES	NO
	50	21	1	4.28E-10	0.017	0.36	0.013	90th Percentile	0.013	µg/L	0.49	Groundwater Method B	NO	NO	0.49	Groundwater Method B	NO	NO
	75	21	1	7.68E-10	0.016	0.24	0.015	90th Percentile	0.015	µg/L	0.49	Groundwater Method B	NO	NO	0.49	Groundwater Method B	NO	NO
	100	21	1	7.17E-10	0.020	0.17	0.018	90th Percentile	0.018	µg/L	0.49	Groundwater Method B	NO	NO	0.49	Groundwater Method B	NO	NO

Table 5-1. Summary of Exposure Point Concentration Calculations and Action Level Exceedances for the Near-field Exposure Area

COPC	Year	Number of Detects	Number of Nondetects	Minimum Calculated	Maximum Calculated	Cmax	90 th Percentile	EPC Basis ⁽¹⁾	Exposure Point Concentration	Units	Action Level	Action Level Basis (Human Health & Aquatic Protection)	Cmax>Action Level?	EPC > Action Level?	Action Level	Action Level Basis (Human Health Protection Standards)	Cmax>Action Level?	EPC > Action Level?
125	21	1	7.05E-10	0.025	0.11	0.022	90th Percentile	0.022	µg/L	0.49	Groundwater Method B	NO	NO	0.49	Groundwater Method B	NO	NO	

(1) 90th percentile EPC values calculated using formula $k=p(n+1)/100$ where k = position in sequence, p = percentile (90), and n = number of values.

Cmax represents the maximum model predicted value for Modeling Zone S1b

COPC = contaminant of potential concern

EPC = exposure point concentration

Table 5-2. Summary of Exposure Point Calculations and Action Level Exceedances for the Far-field Exposure Area

COPC	Year	Number of Detects	Number of Nondetects	Minimum Calculated	Maximum Calculated	Cmax	90 th Percentile	EPC Basis(1)	Exposure Point Concentration	Units	Action Level	Action Level Basis (Human Health & Aquatic Protection)		Cmax>Action Level?	EPC > Action Level?	Action Level	Action Level Basis (Human Health Protection Standards)		Cmax>Action Level?	EPC > Action Level?
Tritium	25	31	2	7.61E-04	60,760	108,490	52,239	90th Percentile	52,239	pCi/L	20,000	Federal MCL	YES	YES	20,000	Federal MCL	YES	YES		
	50	31	2	8.44E-04	13,111	20,904	12,890	90th Percentile	12,890	pCi/L	20,000	Federal MCL	YES	NO	20,000	Federal MCL	YES	NO		
	75	30	3	3.56E-04	1,980	7,864	1,903	90th Percentile	1,903	pCi/L	20,000	Federal MCL	NO	NO	20,000	Federal MCL	NO	NO		
	100	30	3	1.34E-04	266	1,766	257	90th Percentile	257	pCi/L	20,000	Federal MCL	NO	NO	20,000	Federal MCL	NO	NO		
	125	30	3	4.70E-05	38	270	37	90th Percentile	37	pCi/L	20,000	Federal MCL	NO	NO	20,000	Federal MCL	NO	NO		
Iodine-129	25	31	2	3.61E-09	3.0	4.3	2.4	90th Percentile	2.4	pCi/L	1.0	Federal MCL	YES	YES	1.0	Federal MCL	YES	YES		
	50	31	2	9.93E-08	2.8	3.7	2.8	90th Percentile	2.8	pCi/L	1.0	Federal MCL	YES	YES	1.0	Federal MCL	YES	YES		
	75	30	3	2.74E-07	2.8	3.2	2.7	90th Percentile	2.7	pCi/L	1.0	Federal MCL	YES	YES	1.0	Federal MCL	YES	YES		
	100	30	3	4.74E-07	2.6	2.8	2.5	90th Percentile	2.5	pCi/L	1.0	Federal MCL	YES	YES	1.0	Federal MCL	YES	YES		
	125	30	3	7.38E-07	1.8	2.7	1.9	90th Percentile	1.9	pCi/L	1.0	Federal MCL	YES	YES	1.0	Federal MCL	YES	YES		
	150	30	3	1.06E-06	1.4	2.6	1.4	90th Percentile	1.4	pCi/L	1.0	Federal MCL	YES	YES	1.0	Federal MCL	YES	YES		
	175	30	3	1.44E-06	1.4	2.5	1.4	90th Percentile	1.4	pCi/L	1.0	Federal MCL	YES	YES	1.0	Federal MCL	YES	YES		
	200	30	3	1.90E-06	1.4	2.3	1.4	90th Percentile	1.4	pCi/L	1.0	Federal MCL	YES	YES	1.0	Federal MCL	YES	YES		
	300	30	3	4.17E-06	1.1	1.9	1.1	90th Percentile	1.1	pCi/L	1.0	Federal MCL	YES	YES	1.0	Federal MCL	YES	YES		
	400	30	3	6.23E-06	0.74	2.7	0.84	90th Percentile	0.84	pCi/L	1.0	Federal MCL	YES	NO	1.0	Federal MCL	YES	NO		
	500	30	3	7.40E-06	0.57	2.8	0.71	90th Percentile	0.71	pCi/L	1.0	Federal MCL	YES	NO	1.0	Federal MCL	YES	NO		
	600	30	3	7.56E-06	0.41	1.7	0.56	90th Percentile	0.56	pCi/L	1.0	Federal MCL	YES	NO	1.0	Federal MCL	YES	NO		
	700	30	3	6.91E-06	0.31	1.0	0.43	90th Percentile	0.43	pCi/L	1.0	Federal MCL	YES	NO	1.0	Federal MCL	YES	NO		
	800	30	3	5.83E-06	0.24	1.1	0.33	90th Percentile	0.33	pCi/L	1.0	Federal MCL	YES	NO	1.0	Federal MCL	YES	NO		
	900	30	3	4.74E-06	0.19	1.2	0.26	90th Percentile	0.26	pCi/L	1.0	Federal MCL	YES	NO	1.0	Federal MCL	YES	NO		
	1000	30	3	3.77E-06	0.16	1.4	0.20	90th Percentile	0.20	pCi/L	1.0	Federal MCL	YES	NO	1.0	Federal MCL	YES	NO		
Nitrate	25	31	2	1,934	35,705	70,017	35,502	90th Percentile	35,502	µg/L	45,000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO		
	50	31	2	657	34,465	64,706	34,354	90th Percentile	34,354	µg/L	45,000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO		
	75	30	3	261	29,494	61,535	29,161	90th Percentile	29,161	µg/L	45,000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO		
	100	30	3	112	21,352	58,574	20,986	90th Percentile	20,986	µg/L	45,000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO		
	125	30	3	51	13,974	55,816	13,694	90th Percentile	13,694	µg/L	45,000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO		
	150	30	3	24	8,716	53,140	8,529	90th Percentile	8529	µg/L	45,000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO		
	175	30	3	12	5,720	50,541	5,624	90th Percentile	5624	µg/L	45,000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO		
	200	30	3	6.0	4,439	48,006	4,372	90th Percentile	4372	µg/L	45,000	Federal MCL	YES	NO	45,000	Federal MCL	YES	NO		
	300	30	3	0.5	2,431	38,535	2,258	90th Percentile	2258	µg/L	45,000	Federal MCL	NO	NO	45,000	Federal MCL	NO	NO		
	400	30	3	0.1	2,170	30,104	2,167	90th Percentile	2167	µg/L	45,000	Federal MCL	NO	NO	45,000	Federal MCL	NO	NO		

Table 5-2. Summary of Exposure Point Calculations and Action Level Exceedances for the Far-field Exposure Area

COPC	Year	Number of Detects	Number of Nondetects	Minimum Calculated	Maximum Calculated	Cmax	90 th Percentile	EPC Basis(1)	Exposure Point Concentration	Units	Action Level	Action Level Basis (Human Health & Aquatic Protection)	Cmax> Action Level?	EPC > Action Level?	Action Level	Action Level Basis (Human Health Protection Standards)	Cmax> Action Level?	EPC > Action Level?
	500	30	3	0.1	1,891	22,951	1,882	90th Percentile	1882	µg/L	45,000	Federal MCL	NO	NO	45,000	Federal MCL	NO	NO
	600	30	3	0.03	1,276	23,490	1,330	90th Percentile	1330	µg/L	45,000	Federal MCL	NO	NO	45,000	Federal MCL	NO	NO
Tetrachloroethene	25	31	2	1.47E-32	0.56	0.59	0.14	90th Percentile	0.14	µg/L	0.081	Groundwater Method B	YES	YES	0.081	Groundwater Method B	YES	YES
	50	31	2	2.43E-17	0.33	0.33	0.066	90th Percentile	0.066	µg/L	0.081	Groundwater Method B	YES	NO	0.081	Groundwater Method B	YES	NO
	75	30	3	8.98E-11	0.21	0.23	0.045	90th Percentile	0.045	µg/L	0.081	Groundwater Method B	YES	NO	0.081	Groundwater Method B	YES	NO
	100	30	3	1.04E-07	0.13	0.18	0.049	90th Percentile	0.049	µg/L	0.081	Groundwater Method B	YES	NO	0.081	Groundwater Method B	YES	NO
	125	30	3	4.01E-07	0.087	0.14	0.054	90th Percentile	0.054	µg/L	0.081	Groundwater Method B	YES	NO	0.081	Groundwater Method B	YES	NO
Trichloroethene	25	31	2	1.05E-25	0.20	0.81	0.14	90th Percentile	0.14	µg/L	0.5	Groundwater Method B	YES	NO	0.5	Groundwater Method B	YES	NO
	50	31	2	7.02E-12	0.11	0.36	0.067	90th Percentile	0.067	µg/L	0.5	Groundwater Method B	NO	NO	0.5	Groundwater Method B	NO	NO
	75	30	3	1.88E-07	0.060	0.24	0.050	90th Percentile	0.050	µg/L	0.5	Groundwater Method B	NO	NO	0.5	Groundwater Method B	NO	NO
	100	30	3	1.49E-05	0.036	0.17	0.037	90th Percentile	0.037	µg/L	0.5	Groundwater Method B	NO	NO	0.5	Groundwater Method B	NO	NO
	125	30	3	1.26E-04	0.022	0.11	0.029	90th Percentile	0.029	µg/L	0.5	Groundwater Method B	NO	NO	0.5	Groundwater Method B	NO	NO
Carbon Tetrachloride	25	31	2	1.32E-21	0.085	0.28	0.063	90th Percentile	0.063	µg/L	0.23	Human Health Water + Organism	YES	NO	0.34	Groundwater Method B	NO	NO
	50	31	2	3.83E-10	0.037	0.22	0.036	90th Percentile	0.036	µg/L	0.23	Human Health Water + Organism	NO	NO	0.34	Groundwater Method B	NO	NO
	75	30	3	8.10E-07	0.037	0.26	0.034	90th Percentile	0.034	µg/L	0.23	Human Health Water + Organism	YES	NO	0.34	Groundwater Method B	NO	NO
	100	30	3	1.42E-05	0.054	0.40	0.049	90th Percentile	0.049	µg/L	0.23	Human Health Water + Organism	YES	NO	0.34	Groundwater Method B	YES	NO
	125	30	3	9.62E-05	0.072	0.49	0.065	90th Percentile	0.065	µg/L	0.23	Human Health Water + Organism	YES	NO	0.34	Groundwater Method B	YES	NO

(1) 90th percentile EPC values calculated using formula $k=p(n+1)/100$ where k = position in sequence, p = percentile (90), and n = number of values.

Cmax is the maximum of the model predicted Cmax values from modeling zones S1b, S2, and the stream tubes

COPC = contaminant of potential concern

EPC = exposure point concentration

6 References

Comprehensive Environmental Response, Compensation, and Liability Act of 1980,
42 USC 9601, et seq.

EPA/540/1-89/009, 1989, *Risk Assessment Guidance for Superfund Volume I Human Health Evaluation Manual (Part A)*, U.S. Environmental Protection Agency, Washington, D.C.

Appendix A

200-PO-1 Operable Unit Predicted Future Groundwater Concentrations Used for 90th Percentile Calculation for Near-field Exposure Area

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Iodine-129	SUBAREA TIME (year)	Near Field 25 year out	SUBAREA TIME (year)	Near Field 50 years out	SUBAREA TIME (year)	Near Field 75 years out	SUBAREA TIME (year)	Near Field 100 years out	SUBAREA TIME (year)	Near Field 125 years out
Rank										
1	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0
2	299-E17-25	0.032	299-E17-25	0.12	299-E24-16	0.050	299-E25-36	0.017	299-E25-36	0.0072
3	299-E17-23	0.038	299-E17-23	0.12	299-E17-1	0.053	299-E24-20	0.026	299-E24-20	0.010
4	299-E17-1	0.098	299-E17-22	0.13	299-E17-14	0.059	299-E24-16	0.029	299-E25-93	0.016
5	299-E17-14	0.10	299-E17-1	0.17	299-E25-36	0.067	299-E17-1	0.037	299-E25-3	0.018
6	299-E17-22	0.11	299-E17-14	0.18	299-E24-20	0.090	299-E25-3	0.042	299-E24-33	0.019
7	299-E24-16	0.12	299-E24-16	0.19	299-E17-23	0.096	299-E17-14	0.043	299-E24-16	0.027
8	299-E25-36	0.26	299-E25-36	0.25	299-E17-22	0.10	299-E25-93	0.046	299-E25-34	0.034
9	299-E24-20	0.44	299-E24-20	0.28	299-E17-25	0.12	299-E24-33	0.046	299-E26-4	0.035
10	299-E25-3	0.66	299-E25-3	0.33	299-E25-3	0.13	299-E24-23	0.073	299-E17-1	0.038
11	299-E24-23	0.82	299-E24-33	0.36	299-E24-33	0.13	299-E25-20	0.077	299-E25-20	0.038
12	299-E24-33	0.91	299-E25-93	0.36	299-E25-93	0.15	299-E25-19	0.077	299-E25-19	0.038
13	699-43-45	1.0	299-E25-20	0.41	299-E24-23	0.18	299-E25-34	0.095	299-E24-23	0.039
14	299-E25-93	1.1	299-E25-19	0.41	299-E25-20	0.20	299-E26-4	0.10	699-43-45	0.041
15	299-E25-20	1.2	699-43-45	0.41	299-E25-19	0.20	299-E17-22	0.10	299-E17-14	0.043
16	299-E25-19	1.2	299-E24-23	0.42	699-43-45	0.23	699-43-45	0.11	299-E17-22	0.13
17	699-43-44	1.4	299-E26-4	0.56	299-E25-34	0.25	299-E17-23	0.12	299-E17-23	0.14
18	299-E26-4	1.7	299-E25-34	0.57	299-E26-4	0.26	299-E17-25	0.15	299-E17-25	0.18
19	299-E25-34	2.1	699-43-44	0.79	699-43-44	0.50	699-43-44	0.33	699-43-44	0.23
20	699-42-42B	2.2	699-42-42B	1.9	699-42-42B	1.6	699-42-42B	1.3	699-42-42B	1.1
21	699-37-47A	2.9	699-37-47A	2.7	699-37-47A	2.4	699-37-47A	2.1	699-37-47A	1.7
22	CMAX S1b	4.3	CMAX S1b	3.7	CMAX S1b	3.2	CMAX S1b	2.8	CMAX S1b	2.7

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001
Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Iodine-129, cont.	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax Rank	Near Field 150 year out detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 175 year out detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 200 year out detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 300 year out detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 400 year out detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile
	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC
1	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0
2	299-E25-36	0.0042	299-E25-36	0.0030	299-E25-36	0.0025	299-E26-4	7.00E-04	299-E26-4	2.32E-04
3	299-E24-20	0.0056	299-E24-20	0.0037	299-E24-20	0.0027	299-E24-33	9.98E-04	299-E24-33	4.24E-04
4	299-E25-93	0.0075	299-E25-93	0.0045	299-E25-93	0.0030	299-E25-34	0.0012	699-43-45	5.49E-04
5	299-E24-33	0.0092	299-E24-33	0.0054	299-E24-33	0.0035	299-E24-20	0.0013	299-E25-34	5.52E-04
6	299-E25-3	0.010	299-E26-4	0.0066	299-E26-4	0.0036	299-E25-93	0.0014	299-E24-20	7.64E-04
7	299-E26-4	0.014	299-E25-3	0.0069	299-E25-34	0.0042	699-43-45	0.0020	299-E25-93	9.31E-04
8	299-E25-34	0.014	299-E25-34	0.0070	299-E25-3	0.0053	299-E25-36	0.0023	299-E25-36	0.0019
9	699-43-45	0.020	699-43-45	0.012	699-43-45	0.0078	299-E25-3	0.0029	299-E25-3	0.0019
10	299-E24-23	0.024	299-E24-23	0.017	299-E24-23	0.013	299-E25-20	0.0090	299-E25-20	0.0054
11	299-E25-20	0.025	299-E25-20	0.019	299-E25-20	0.016	299-E25-19	0.0090	299-E25-19	0.0054
12	299-E25-19	0.025	299-E25-19	0.019	299-E25-19	0.016	299-E24-23	0.013	699-43-44	0.0097
13	299-E24-16	0.029	299-E24-16	0.033	299-E24-16	0.036	699-43-44	0.026	299-E24-23	0.012
14	299-E17-1	0.041	299-E17-1	0.048	299-E17-1	0.053	299-E24-16	0.047	299-E24-16	0.046
15	299-E17-14	0.046	299-E17-14	0.053	299-E17-14	0.059	299-E17-1	0.071	299-E17-1	0.070
16	299-E17-22	0.15	699-43-44	0.11	699-43-44	0.082	299-E17-14	0.079	299-E17-14	0.078
17	699-43-44	0.16	299-E17-22	0.17	299-E17-22	0.20	699-42-42B	0.26	699-42-42B	0.12
18	299-E17-23	0.17	299-E17-23	0.20	299-E17-23	0.22	299-E17-22	0.30	699-37-47A	0.19
19	299-E17-25	0.21	299-E17-25	0.25	299-E17-25	0.29	299-E17-23	0.31	299-E17-22	0.30
20	699-42-42B	0.90	699-42-42B	0.73	699-42-42B	0.59	699-37-47A	0.39	299-E17-23	0.31
21	699-37-47A	1.4	699-37-47A	1.1	699-37-47A	0.89	299-E17-25	0.40	299-E17-25	0.40
22	CMAX S1b	2.6	CMAX S1b	2.5	CMAX S1b	2.3	CMAX S1b	1.9	CMAX S1b	2.7

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001
Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Iodine-129, cont.	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax Rank	Near Field 500 year out detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 600 year out detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 700 year out detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 800 year out detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 900 year out detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile
	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC
1	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0
2	299-E26-4	1.19E-04	299-E26-4	1.03E-04	299-E26-4	1.26E-04	299-E26-4	1.17E-04	299-E26-4	1.60E-04
3	299-E24-33	2.22E-04	299-E24-33	1.56E-04	299-E24-33	1.61E-04	299-E24-33	1.52E-04	299-E25-34	2.03E-04
4	299-E25-34	2.99E-04	299-E25-34	2.06E-04	299-E25-34	2.07E-04	299-E25-34	1.71E-04	699-43-45	2.08E-04
5	699-43-45	3.98E-04	699-43-45	2.65E-04	699-43-45	2.32E-04	699-43-45	2.62E-04	299-E24-33	2.17E-04
6	299-E24-20	5.08E-04	299-E24-20	3.79E-04	299-E24-20	3.23E-04	299-E24-20	2.83E-04	299-E25-93	3.19E-04
7	299-E25-93	6.23E-04	299-E25-93	4.47E-04	299-E25-93	3.70E-04	299-E25-93	2.98E-04	299-E24-20	3.24E-04
8	299-E25-3	0.0013	299-E25-3	9.28E-04	299-E25-3	7.22E-04	299-E25-3	5.79E-04	699-43-44	3.70E-04
9	299-E25-36	0.0015	299-E25-36	0.0012	299-E25-36	9.03E-04	699-43-44	6.02E-04	299-E25-3	5.43E-04
10	299-E25-20	0.0032	299-E25-20	0.0020	699-43-44	0.0011	299-E25-36	7.73E-04	299-E25-20	6.46E-04
11	299-E25-19	0.0032	299-E25-19	0.0020	299-E25-20	0.0013	299-E25-20	8.74E-04	299-E25-19	6.46E-04
12	699-43-44	0.0042	699-43-44	0.0020	299-E25-19	0.0013	299-E25-19	8.74E-04	299-E25-36	7.11E-04
13	299-E24-23	0.0092	299-E24-23	0.0068	299-E24-23	0.0053	299-E24-23	0.0043	299-E24-23	0.0034
14	299-E24-16	0.035	299-E24-16	0.026	699-42-42B	0.015	699-42-42B	0.0080	699-42-42B	0.0044
15	299-E17-1	0.053	699-42-42B	0.029	299-E24-16	0.020	299-E24-16	0.016	299-E24-16	0.012
16	699-42-42B	0.058	299-E17-1	0.039	299-E17-1	0.031	699-37-47A	0.023	699-37-47A	0.017
17	299-E17-14	0.058	299-E17-14	0.043	299-E17-14	0.034	299-E17-1	0.025	299-E17-1	0.018
18	699-37-47A	0.10	699-37-47A	0.057	699-37-47A	0.035	299-E17-14	0.027	299-E17-14	0.020
19	299-E17-23	0.23	299-E17-22	0.19	299-E17-22	0.15	299-E17-22	0.12	299-E17-22	0.096
20	299-E17-22	0.24	299-E17-23	0.20	299-E17-23	0.20	299-E17-23	0.19	299-E17-23	0.18
21	299-E17-25	0.30	299-E17-25	0.29	299-E17-25	0.29	299-E17-25	0.27	299-E17-25	0.26
22	CMAX S1b	2.8	CMAX S1b	1.7	CMAX S1b	1.0	CMAX S1b	1.1	CMAX S1b	1.2

$$K = \frac{p(n+1)}{100}$$

$$90\text{th percentile} = \frac{k_{\text{rounddown}} + k_{\text{roundup}}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001
Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Iodine-129, cont.	SUBAREA	Near Field 1000 year out
	TIME (year)	
detects		21
nondetects		1.0
n (number of values)		22
p (percentile)		90
k (position in sequence)		20.7
revised mean 90th percentile		0.20
Cmax		1.4
Rank	excel percentile	0.15
Row Labels		Max of CONC
1 699-45-42		0
2 699-43-44		2.35E-04
3 299-E26-4		2.77E-04
4 299-E25-34		3.27E-04
5 299-E24-33		3.68E-04
6 299-E25-93		4.33E-04
7 699-43-45		4.44E-04
8 299-E24-20		4.50E-04
9 299-E25-3		6.05E-04
10 299-E25-20		6.33E-04
11 299-E25-19		6.33E-04
12 299-E25-36		7.30E-04
13 699-42-42B		0.0025
14 299-E24-23		0.0027
15 299-E24-16		0.0094
16 699-37-47A		0.013
17 299-E17-1		0.014
18 299-E17-14		0.016
19 299-E17-22		0.075
20 299-E17-23		0.16
21 299-E17-25		0.24
22 CMAX_S1b		1.4

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001
 Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Strontium-90	SUBAREA TIME (year)	Near Field 25 year out	SUBAREA TIME (year)	Near Field 50 years out	SUBAREA TIME (year)	Near Field 75 years out	SUBAREA TIME (year)	Near Field 100 years out	SUBAREA TIME (year)	Near Field 125 years out
Rank	excel percentile	0.022	excel percentile	0.0094	excel percentile	0.0037	excel percentile	0.0016	excel percentile	0.0011
1	299-E25-20	0	299-E25-93	0	299-E25-93	0	699-45-42	0	699-45-42	0
2	299-E25-3	0	699-45-42	0	699-45-42	0	699-43-44	0	699-43-44	0
3	699-45-42	0	299-E25-3	0	299-E25-34	0	699-42-42B	8.05E-35	699-42-42B	0
4	299-E25-19	0	699-37-47A	0	699-43-44	0	699-43-45	6.00E-18	699-43-45	2.52E-16
5	299-E24-20	0	299-E25-34	0	699-42-42B	3.38E-37	299-E25-34	8.38E-14	299-E25-34	2.59E-12
6	699-42-42B	0	699-42-42B	9.50E-42	699-43-45	1.70E-20	299-E26-4	2.41E-12	299-E26-4	2.22E-11
7	699-37-47A	0	699-43-44	7.04E-36	299-E26-4	7.56E-15	299-E25-20	8.56E-09	299-E25-20	9.23E-09
8	699-43-44	1.52E-43	699-43-45	1.77E-23	699-37-47A	3.98E-09	299-E25-19	8.56E-09	299-E25-19	9.23E-09
9	699-43-45	5.97E-31	299-E26-4	1.03E-17	299-E25-20	4.13E-09	299-E25-93	8.62E-09	699-37-47A	3.13E-08
10	299-E25-34	3.29E-21	299-E25-20	5.33E-11	299-E25-19	4.13E-09	699-37-47A	1.77E-08	299-E25-93	8.84E-08
11	299-E26-4	8.12E-20	299-E25-19	5.33E-11	299-E25-3	3.51E-08	299-E25-3	1.55E-07	299-E25-36	1.75E-07
12	299-E24-33	3.59E-15	299-E24-20	1.80E-08	299-E24-20	1.91E-07	299-E24-20	1.80E-06	299-E25-3	3.46E-07
13	299-E25-93	5.20E-12	299-E24-33	2.05E-07	299-E24-33	4.92E-07	299-E25-36	4.10E-06	299-E24-20	9.36E-06
14	299-E25-36	6.02E-06	299-E25-36	1.31E-05	299-E25-36	1.01E-05	299-E24-33	6.06E-06	299-E24-33	2.68E-05
15	299-E17-25	8.44E-06	299-E17-25	4.37E-05	299-E17-25	3.45E-05	299-E17-25	5.19E-05	299-E17-25	1.60E-04
16	299-E17-23	1.15E-04	299-E17-23	2.57E-04	299-E17-23	1.45E-04	299-E17-23	1.11E-04	299-E17-23	2.43E-04
17	299-E24-23	5.02E-04	299-E17-22	5.29E-04	299-E17-22	2.39E-04	299-E17-22	2.36E-04	299-E17-22	5.30E-04
18	299-E17-22	8.28E-04	299-E24-23	0.0012	299-E24-23	0.0012	299-E24-16	8.75E-04	299-E24-23	6.02E-04
19	299-E24-16	0.010	299-E24-16	0.0047	299-E24-16	0.0019	299-E24-23	9.25E-04	299-E24-16	7.43E-04
20	299-E17-1	0.024	299-E17-1	0.0099	299-E17-1	0.0039	299-E17-1	0.0016	299-E17-1	0.0011
21	299-E17-14	0.16	299-E17-14	0.064	299-E17-14	0.025	299-E17-14	0.0096	299-E17-14	0.0040
22	CMAX S1b	5.2	CMAx S1b	2.8	CMAx S1b	1.5	CMAx S1b	0.81	CMAx S1b	0.44

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001
 Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Techneium-99	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax Rank	Near Field 25 years out	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 50 years out	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 75 years out	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 100 years out	SUBAREA TIME (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 125 years out
	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC
1	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0
2	699-42-42B	2.35E-04	699-42-42B	0.031	699-42-42B	0.055	299-E25-36	0.038	299-E25-36	0.028
3	699-43-44	0.16	699-43-44	0.26	299-E25-36	0.074	699-43-44	0.060	699-43-45	0.032
4	299-E17-1	0.87	299-E25-36	0.27	699-43-44	0.12	699-42-42B	0.071	699-43-44	0.037
5	299-E17-14	0.93	299-E24-16	0.45	299-E24-20	0.17	299-E24-20	0.078	299-E24-20	0.045
6	299-E24-16	0.95	299-E17-1	0.60	299-E24-23	0.27	299-E24-23	0.12	299-E26-4	0.073
7	299-E17-22	1.0	299-E17-14	0.66	299-E25-3	0.29	699-43-45	0.14	699-42-42B	0.077
8	299-E17-23	1.2	299-E24-20	0.73	299-E25-93	0.35	299-E25-3	0.15	299-E24-23	0.091
9	299-E17-25	1.5	299-E24-23	0.99	299-E24-16	0.40	299-E25-93	0.17	299-E25-3	0.093
10	699-37-47A	1.6	299-E25-3	1.1	299-E17-1	0.56	299-E26-4	0.20	299-E25-34	0.096
11	299-E25-36	3.6	299-E25-93	1.7	699-43-45	0.58	299-E25-34	0.21	299-E24-33	0.10
12	299-E24-23	6.9	299-E17-22	1.9	299-E24-33	0.60	299-E24-33	0.22	299-E25-93	0.12
13	299-E24-20	7.8	299-E17-23	2.0	299-E17-14	0.62	299-E24-16	0.29	299-E24-16	0.34
14	299-E25-3	9.4	299-E17-25	2.6	299-E25-34	0.64	299-E17-1	0.42	299-E17-1	0.50
15	299-E25-93	21	299-E24-33	3.0	299-E26-4	0.69	299-E17-14	0.46	299-E17-14	0.54
16	299-E25-20	24	699-43-45	3.2	299-E25-20	1.4	299-E25-20	0.90	299-E25-20	0.63
17	299-E25-19	24	299-E25-20	3.3	299-E25-19	1.4	299-E25-19	0.90	299-E25-19	0.63
18	299-E24-33	44	299-E25-19	3.3	299-E17-22	2.0	299-E17-23	1.6	699-37-47A	1.6
19	299-E25-34	56	699-37-47A	4.0	299-E17-23	2.1	299-E17-22	1.6	299-E17-22	1.9
20	699-43-45	74	299-E25-34	4.4	299-E17-25	2.6	299-E17-25	2.0	299-E17-23	2.0
21	299-E26-4	75	299-E26-4	4.7	699-37-47A	3.6	699-37-47A	2.4	299-E17-25	2.5
22	CMAX S1b	96	CMAX S1b	44	CMAX S1b	24	CMAX S1b	18	CMAX S1b	14

$$K = \frac{p(n+1)}{100}$$

$$90\text{th percentile} = \frac{k_{\text{rounddown}} + k_{\text{roundup}}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Uranium	SUBAREA TIME (year)	Near Field 25 year out	SUBAREA TIME (year)	Near Field 50 years out	SUBAREA TIME (year)	Near Field 75 years out	SUBAREA TIME (year)	Near Field 100 years out	SUBAREA TIME (year)	Near Field 125 years out
Rank										
	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC
1	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0
2	699-42-42B	0	699-42-42B	1.13E-11	699-42-42B	0	699-42-42B	0	699-42-42B	0
3	699-43-44	0	699-43-44	1.04E-07	699-43-44	1.01E-05	699-43-44	1.04E-04	699-43-44	3.81E-04
4	699-43-45	2.59E-05	299-E17-25	0.017	299-E17-25	0.011	299-E17-25	0.0096	299-E17-25	0.0093
5	299-E26-4	0.0073	299-E17-23	0.028	299-E17-23	0.016	299-E17-23	0.013	299-E17-23	0.012
6	699-37-47A	0.016	699-43-45	0.043	299-E17-22	0.050	299-E17-22	0.030	299-E17-22	0.024
7	299-E25-34	0.024	299-E17-22	0.12	299-E17-1	0.11	299-E17-1	0.067	299-E17-1	0.048
8	299-E17-25	0.14	299-E26-4	0.15	299-E17-14	0.14	299-E24-16	0.087	299-E24-16	0.059
9	299-E17-23	0.23	699-37-47A	0.16	299-E24-16	0.14	299-E17-14	0.095	299-E24-20	0.068
10	299-E17-22	0.40	299-E17-1	0.22	299-E24-33	0.24	299-E24-20	0.13	299-E17-14	0.071
11	299-E25-93	0.66	299-E17-14	0.27	299-E24-20	0.25	299-E24-33	0.16	299-E24-33	0.11
12	299-E17-1	0.93	299-E25-34	0.28	299-E26-4	0.34	299-E25-93	0.22	299-E25-93	0.13
13	299-E17-14	1.0	299-E24-16	0.31	299-E25-34	0.35	299-E25-36	0.23	299-E25-36	0.13
14	299-E24-20	1.0	299-E24-33	0.41	299-E25-93	0.41	299-E25-34	0.30	299-E25-3	0.23
15	299-E24-33	1.2	299-E24-20	0.54	699-43-45	0.42	299-E25-3	0.36	299-E25-20	0.24
16	299-E24-16	1.2	299-E25-93	0.69	299-E25-36	0.46	299-E25-20	0.40	299-E25-19	0.24
17	299-E25-20	1.7	299-E25-36	1.2	699-37-47A	0.53	299-E25-19	0.40	299-E25-34	0.25
18	299-E25-19	1.7	299-E25-20	1.2	299-E25-3	0.65	299-E26-4	0.47	299-E26-4	0.41
19	299-E25-3	3.9	299-E25-19	1.2	299-E25-20	0.71	699-43-45	0.77	699-43-45	0.67
20	299-E25-36	4.5	299-E25-3	1.4	299-E25-19	0.71	699-37-47A	1.1	299-E24-23	1.1
21	299-E24-23	15	299-E24-23	5.7	299-E24-23	2.8	299-E24-23	1.7	699-37-47A	1.6
22	CMAX S1b	71	CMAX S1b	60	CMAX S1b	49	CMAX S1b	40	CMAX S1b	37

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, Probability and Statistical Inference, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Uranium, cont.	SUBAREA	Near Field	SUBAREA	Near Field								
	Time (year)	150	Time (year)	175	Time (year)	200	Time (year)	300	Time (year)	400		
Rank	Row Labels	Max of CONC	Row Labels	Max of CONC								
1	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0
2	699-42-42B	0	699-42-42B	0	699-42-42B	9.62E-05	699-42-42B	0.0016	699-43-44	0.0016	699-42-42B	0.0011
3	699-43-44	8.07E-04	699-43-44	0.0012	699-43-44	0.0016	699-43-44	0.0016	699-43-44	0.0016	699-42-42B	0.0025
4	299-E17-25	0.0092	299-E17-25	0.0084	299-E17-25	0.0075	299-E17-25	0.0057	299-E24-20	0.0031		
5	299-E17-23	0.012	299-E17-23	0.011	299-E17-23	0.0095	299-E24-20	0.0061	299-E24-33	0.0031		
6	299-E17-22	0.021	299-E17-22	0.020	299-E24-20	0.018	299-E17-23	0.0069	299-E25-93	0.0044		
7	299-E17-1	0.037	299-E24-20	0.026	299-E17-22	0.018	299-E24-33	0.0083	299-E25-34	0.0048		
8	299-E24-20	0.040	299-E17-1	0.030	299-E17-1	0.026	299-E25-93	0.010	699-43-45	0.0049		
9	299-E24-16	0.044	299-E24-16	0.035	299-E24-16	0.029	299-E17-1	0.014	299-E26-4	0.0054		
10	299-E17-14	0.056	299-E17-14	0.045	299-E24-33	0.034	299-E25-36	0.015	299-E25-36	0.0066		
11	299-E24-33	0.074	299-E24-33	0.050	299-E25-93	0.035	299-E24-16	0.015	299-E24-16	0.012		
12	299-E25-93	0.078	299-E25-93	0.051	299-E17-14	0.038	299-E17-22	0.016	299-E17-1	0.013		
13	299-E25-36	0.084	299-E25-36	0.057	299-E25-36	0.041	299-E25-34	0.018	299-E17-14	0.017		
14	299-E25-20	0.16	299-E25-20	0.11	299-E25-20	0.082	699-43-45	0.019	299-E17-23	0.018		
15	299-E25-19	0.16	299-E25-19	0.11	299-E25-19	0.082	299-E26-4	0.020	299-E17-22	0.020		
16	299-E25-3	0.16	299-E25-3	0.12	299-E25-34	0.092	299-E17-14	0.021	299-E17-25	0.021		
17	299-E25-34	0.19	299-E25-34	0.14	299-E25-3	0.096	299-E25-20	0.034	299-E25-20	0.021		
18	299-E26-4	0.28	299-E26-4	0.18	299-E26-4	0.11	299-E25-19	0.034	299-E25-19	0.021		
19	699-43-45	0.43	699-43-45	0.24	699-43-45	0.13	299-E25-3	0.046	299-E25-3	0.027		
20	299-E24-23	0.76	299-E24-23	0.56	299-E24-23	0.43	299-E24-23	0.18	299-E24-23	0.092		
21	699-37-47A	2.1	699-37-47A	2.4	699-37-47A	2.5	699-37-47A	2.4	699-37-47A	1.9		
22	CMAX	35	CMAX	33	CMAX	30	CMAX	21	CMAX	15		

$$K = \frac{p(n+1)}{100}$$

$$90\text{th percentile} = \frac{k_{\text{rounddown}} + k_{\text{roundup}}}{2}$$

reference for K calculation: Hogg and Tanis, Probability and Statistical Inference, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down)th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Uranium, cont.	Time (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	500	Time (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	600	Time (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	700
Rank	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC
1	699-45-42	0	699-45-42	0	699-45-42	0
2	699-43-44	6.73E-04	699-43-44	4.41E-04	699-43-45	2.25E-04
3	299-E24-33	0.0014	699-43-45	6.33E-04	699-43-44	3.10E-04
4	699-43-45	0.0018	299-E24-33	6.72E-04	299-E26-4	3.35E-04
5	299-E24-20	0.0019	299-E26-4	8.35E-04	299-E24-33	3.89E-04
6	299-E25-34	0.0020	299-E25-34	9.78E-04	299-E25-34	5.65E-04
7	299-E26-4	0.0021	299-E24-20	0.0014	299-E24-20	0.0013
8	299-E25-93	0.0026	299-E25-93	0.0018	299-E25-93	0.0014
9	699-42-42B	0.0027	699-42-42B	0.0024	699-42-42B	0.0021
10	299-E25-36	0.0041	299-E25-36	0.0034	299-E25-36	0.0037
11	299-E25-20	0.016	299-E25-20	0.013	299-E25-3	0.011
12	299-E25-19	0.016	299-E25-19	0.013	299-E25-20	0.011
13	299-E25-3	0.019	299-E25-3	0.014	299-E25-19	0.011
14	299-E24-16	0.019	299-E24-23	0.037	299-E24-23	0.028
15	299-E17-1	0.025	299-E24-16	0.038	299-E24-16	0.062
16	299-E17-14	0.029	299-E17-1	0.055	299-E17-1	0.091
17	299-E24-23	0.055	299-E17-14	0.061	299-E17-14	0.10
18	299-E17-22	0.061	299-E17-22	0.16	299-E17-22	0.30
19	299-E17-23	0.076	299-E17-23	0.20	299-E17-23	0.36
20	299-E17-25	0.095	299-E17-25	0.26	299-E17-25	0.46
21	699-37-47A	1.6	699-37-47A	1.3	699-37-47A	1.0
22	CMAX	11	CMAX	7.6	CMAX	6.7

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, Probability and Statistical Inference, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Nitrate	SUBAREA TIME (year)	Near Field 25 year out	SUBAREA TIME (year)	Near Field 50 years out	SUBAREA TIME (year)	Near Field 75 years out	SUBAREA TIME (year)	Near Field 100 years out	SUBAREA TIME (year)	Near Field 125 years out
Rank										
1	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0
2	699-42-42B	0.084	699-42-42B	3.4	699-42-42B	6.2	699-43-44	8.0	699-43-44	5.2
3	699-43-44	31	699-43-44	33	699-43-44	15	699-42-42B	8.2	699-42-42B	9.2
4	299-E25-36	748	299-E24-20	104	299-E24-20	53	699-43-45	39	699-43-45	31
5	299-E24-20	833	299-E25-36	125	299-E25-93	65	299-E24-20	40	299-E26-4	35
6	299-E25-3	1,231	299-E25-93	168	299-E24-33	71	299-E26-4	40	299-E25-34	38
7	299-E25-93	1,798	299-E25-3	198	299-E25-36	78	299-E25-34	41	299-E24-33	44
8	299-E25-20	2,047	299-E24-33	238	299-E25-34	79	299-E25-93	42	299-E24-20	47
9	299-E25-19	2,047	299-E25-20	301	299-E26-4	84	299-E24-33	42	299-E25-93	49
10	299-E24-16	2,581	299-E25-19	301	699-43-45	96	299-E25-36	63	299-E25-36	68
11	299-E24-33	2,735	299-E25-34	356	299-E25-3	106	299-E25-3	73	299-E25-3	72
12	299-E24-23	2,991	699-43-45	386	299-E25-20	152	299-E25-20	106	299-E25-20	93
13	299-E17-1	3,385	299-E26-4	399	299-E25-19	152	299-E25-19	106	299-E25-19	93
14	299-E17-14	3,669	299-E24-23	756	299-E24-23	363	299-E24-23	228	299-E24-23	189
15	299-E25-34	3,739	299-E24-16	982	299-E24-16	787	299-E24-16	691	299-E24-16	588
16	299-E26-4	5,313	299-E17-1	1,370	299-E17-1	1,121	299-E17-1	989	299-E17-1	835
17	699-37-47A	6,480	299-E17-14	1,513	299-E17-14	1,231	299-E17-14	1,081	299-E17-14	910
18	699-43-45	6,787	299-E17-23	4,405	299-E17-23	3,928	299-E17-23	3,558	299-E17-23	2,990
19	299-E17-22	7,770	299-E17-22	4,779	299-E17-22	3,978	299-E17-22	3,608	299-E17-22	3,226
20	299-E17-23	8,365	299-E17-25	5,537	299-E17-25	4,956	299-E17-25	4,486	299-E17-25	3,763
21	299-E17-25	10,229	699-37-47A	10,942	699-37-47A	9,620	699-37-47A	7,202	699-37-47A	5,327
22	CMAX S1b	70,017	CMAX S1b	64,706	CMAX S1b	61,535	CMAX S1b	58,574	CMAX S1b	55,816

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, Probability and Statistical Inference, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Nitrate, cont.	SUBAREA	Near Field										
Rank	Row Labels	Max of CONC										
1	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0
2	699-43-44	4.0	699-43-44	3.2	699-43-44	2.6	699-43-44	1.2	699-43-44	0.55	699-43-44	0
3	699-42-42B	9.0	699-42-42B	8.3	699-42-42B	7.2	699-42-42B	3.5	699-42-42B	1.6	699-42-42B	1.6
4	699-43-45	24	699-43-45	26	699-43-45	22	699-43-45	20	299-E24-33	2.3	299-E24-33	2.3
5	299-E26-4	31	299-E26-4	33	299-E26-4	33	299-E26-4	25	299-E24-20	5.1	299-E24-20	5.1
6	299-E25-34	35	299-E24-33	36	299-E24-33	35	299-E25-34	29	299-E25-34	5.2	299-E25-34	5.2
7	299-E24-33	39	299-E25-34	37	299-E25-34	38	299-E24-33	43	299-E26-4	5.6	299-E26-4	5.6
8	299-E24-20	43	299-E24-20	40	299-E24-20	40	299-E25-93	43	299-E25-93	5.7	299-E25-93	5.7
9	299-E25-93	45	299-E25-93	45	299-E25-93	46	299-E24-20	49	699-43-45	7.0	699-43-45	7.0
10	299-E25-36	63	299-E25-3	60	299-E25-3	60	299-E25-20	51	299-E25-20	13	299-E25-20	13
11	299-E25-3	63	299-E25-36	62	299-E25-36	65	299-E25-19	51	299-E25-19	13	299-E25-19	13
12	299-E25-20	79	299-E25-20	72	299-E25-20	69	299-E25-3	65	299-E25-3	15	299-E25-3	15
13	299-E25-19	79	299-E25-19	72	299-E25-19	69	299-E25-36	81	299-E25-36	23	299-E25-36	23
14	299-E24-23	182	299-E24-23	203	299-E24-23	227	299-E24-23	258	299-E24-23	130	299-E24-23	130
15	299-E24-16	580	299-E24-16	701	299-E24-16	818	699-37-47A	768	699-37-47A	401	699-37-47A	401
16	299-E17-1	819	299-E17-1	985	299-E17-1	1,140	299-E24-16	883	299-E24-16	515	299-E24-16	515
17	299-E17-14	888	299-E17-14	1,057	299-E17-14	1,214	299-E17-1	1,212	299-E17-1	720	299-E17-1	720
18	299-E17-23	2,820	699-37-47A	2,910	699-37-47A	2,149	299-E17-14	1,284	299-E17-14	765	299-E17-14	765
19	299-E17-22	2,986	299-E17-22	3,071	299-E17-22	3,265	299-E17-22	3,400	299-E17-22	2,282	299-E17-22	2,282
20	299-E17-25	3,518	299-E17-23	3,169	299-E17-23	3,469	299-E17-23	3,443	299-E17-23	3,106	299-E17-23	3,106
21	699-37-47A	3,937	299-E17-25	3,893	299-E17-25	4,202	299-E17-25	4,157	299-E17-25	4,021	299-E17-25	4,021
22	CMAX_S1b	53,140	CMAX_S1b	50,541	CMAX_S1b	48,006	CMAX_S1b	38,535	CMAX_S1b	30,104	CMAX_S1b	30,104

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, Probability and Statistical Inference, p. 33, 2001

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Nitrate, cont.	SUBAREA Time (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 500	SUBAREA Time (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 600	SUBAREA Time (year) detects nondetects n (number of values) p (percentile) k (position in sequence) revised mean 90th percentile Cmax excel percentile	Near Field 700
Rank	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC
1	299-E25-20	0	299-E25-20	0	299-E25-20	0
2	299-E25-3	0	299-E25-3	0	299-E25-3	0
3	299-E25-34	0	299-E25-34	0	299-E17-14	0
4	699-45-42	0	699-45-42	0	299-E25-34	0
5	299-E25-36	0	299-E25-36	0	299-E17-1	0
6	299-E24-20	0	299-E24-20	0	699-45-42	0
7	299-E25-93	0	299-E25-93	0	299-E24-16	0
8	299-E24-33	0	299-E24-33	0	299-E25-36	0
9	299-E26-4	0	299-E26-4	0	299-E24-23	0
10	299-E25-19	0	299-E24-16	0	299-E25-93	0
11	699-43-45	0	699-43-45	0	299-E25-19	0
12	699-43-44	0.21	299-E24-23	0	299-E26-4	0
13	699-42-42B	0.70	299-E25-19	0	299-E24-20	0
14	299-E24-23	22	699-43-44	0	699-37-47A	0
15	699-37-47A	243	699-42-42B	0	699-43-45	0
16	299-E24-16	274	699-37-47A	76	699-42-42B	0
17	299-E17-1	407	299-E17-1	122	299-E24-33	0
18	299-E17-14	436	299-E17-14	149	699-43-44	0
19	299-E17-22	1,485	299-E17-22	1,059	299-E17-22	1,435
20	299-E17-23	2,695	299-E17-23	2,136	299-E17-23	1,747
21	299-E17-25	3,417	299-E17-25	2,718	299-E17-25	2,350
22	CMAX_S1b	22,951	CMAX_S1b	23,490	CMAX_S1b	101,350

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, Probability and Statistical Inference, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

TCE	SUBAREA TIME (year)	Near Field 25 year out	SUBAREA TIME (year)	Near Field 50 years out	SUBAREA TIME (year)	Near Field 75 years out	SUBAREA TIME (year)	Near Field 100 years out	SUBAREA TIME (year)	Near Field 125 years out
	detects	21	detects	21	detects	21	detects	21	detects	21
	nondetects	1.0	nondetects	1.0	nondetects	1.0	nondetects	1.0	nondetects	1.0
	n (number of values)	22	n (number of values)	22	n (number of values)	22	n (number of values)	22	n (number of values)	22
	p (percentile)	90	p (percentile)	90	p (percentile)	90	p (percentile)	90	p (percentile)	90
	k (position in sequence)	20.7	k (position in sequence)	20.7	k (position in sequence)	20.7	k (position in sequence)	20.7	k (position in sequence)	20.7
	revised mean 90th percentile	0.0096	revised mean 90th percentile	0.013	revised mean 90th percentile	0.015	revised mean 90th percentile	0.018	revised mean 90th percentile	0.022
	Cmax	0.81	Cmax	0.36	Cmax	0.24	Cmax	0.17	Cmax	0.11
Rank	excel percentile	0.0055	excel percentile	0.0084	excel percentile	0.014	excel percentile	0.016	excel percentile	0.020
	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC
1	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0	699-45-42	0
2	699-42-42B	9.50E-13	699-42-42B	4.28E-10	699-43-44	7.68E-10	699-43-44	7.17E-10	699-43-44	7.05E-10
3	699-43-44	6.76E-11	699-43-44	6.77E-10	699-42-42B	1.19E-09	699-42-42B	2.14E-09	699-42-42B	3.37E-09
4	699-43-45	9.15E-08	699-43-45	6.70E-08	699-43-45	5.11E-08	699-43-45	5.28E-08	699-43-45	6.85E-08
5	299-E26-4	2.28E-06	299-E26-4	7.97E-07	299-E26-4	8.23E-07	299-E26-4	9.15E-07	299-E26-4	1.23E-06
6	299-E24-33	2.65E-06	299-E24-33	2.55E-06	299-E24-33	3.17E-06	299-E24-33	4.45E-06	299-E24-33	6.48E-06
7	299-E25-34	4.65E-05	299-E25-34	1.22E-05	299-E25-34	8.57E-06	299-E25-34	7.63E-06	299-E25-34	8.71E-06
8	299-E24-20	7.69E-05	299-E24-20	4.59E-05	299-E24-20	3.04E-05	299-E24-20	2.88E-05	299-E25-93	3.11E-05
9	299-E25-93	1.47E-04	299-E25-93	5.38E-05	299-E25-93	3.45E-05	299-E25-93	2.96E-05	299-E24-20	3.32E-05
10	299-E24-16	3.62E-04	299-E25-36	3.41E-04	299-E25-36	1.74E-04	299-E25-36	1.57E-04	299-E25-20	1.46E-04
11	299-E17-1	4.51E-04	299-E25-20	3.83E-04	299-E25-20	2.22E-04	299-E25-20	1.64E-04	299-E25-19	1.46E-04
12	299-E17-14	5.54E-04	299-E25-19	3.83E-04	299-E25-19	2.22E-04	299-E25-19	1.64E-04	299-E25-36	1.85E-04
13	299-E17-22	9.72E-04	299-E25-3	6.69E-04	299-E25-3	4.26E-04	299-E25-3	2.99E-04	299-E25-3	2.43E-04
14	299-E25-20	0.0011	299-E24-16	0.0013	299-E24-23	0.0018	299-E24-23	0.0010	299-E24-23	9.89E-04
15	299-E25-19	0.0011	299-E17-1	0.0019	299-E24-16	0.0021	299-E24-16	0.0028	299-E24-16	0.0035
16	299-E17-23	0.0012	299-E17-14	0.0021	299-E17-1	0.0031	299-E17-1	0.0042	299-E17-1	0.0052
17	299-E25-36	0.0014	299-E24-23	0.0041	299-E17-14	0.0033	299-E17-14	0.0046	299-E17-14	0.0056
18	299-E17-25	0.0015	299-E17-22	0.0055	299-E17-22	0.0098	699-37-47A	0.012	699-37-47A	0.0089
19	299-E25-3	0.0016	299-E17-23	0.0068	299-E17-23	0.011	299-E17-22	0.015	299-E17-23	0.020
20	699-37-47A	0.0059	299-E17-25	0.0086	299-E17-25	0.015	299-E17-23	0.016	299-E17-22	0.020
21	299-E24-23	0.013	699-37-47A	0.017	699-37-47A	0.016	299-E17-25	0.020	299-E17-25	0.025
22	CMAX S1b	0.81	CMAX S1b	0.36	CMAX S1b	0.24	CMAX S1b	0.17	CMAX S1b	0.11

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, Probability and Statistical Inference, p. 33, 2001
 Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Appendix B

200-PO-1 Operable Unit Predicted Future Groundwater Concentrations Used for 90th Percentile Calculation for the Near-Field Exposure Area

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Far-Field Exposure Area

Iodine-129		SUBAREA	Far Field	SUBAREA	Far Field	SUBAREA	Far Field	SUBAREA	Far Field	SUBAREA	Far Field	SUBAREA	Far Field
	TIME (year)	25 year out	TIME (year)	50 years out	TIME (year)	75 years out	TIME (year)	100 years out	TIME (year)	125 years out			
	detects	31	detects	31	detects	30	detects	30	detects	30			
	nondetects	2.0	nondetects	2.0	nondetects	3.0	nondetects	3.0	nondetects	3.0			
	n (number of values)	33	n (number of values)	33	n (number of values)	33	n (number of values)	33	n (number of values)	33			
	p (percentile)	90	p (percentile)	90	p (percentile)	90	p (percentile)	90	p (percentile)	90			
	k (position in sequence)	30.6	k (position in sequence)	30.6	k (position in sequence)	30.6	k (position in sequence)	30.6	k (position in sequence)	30.6			
	revised mean 90th percentile	2.4	revised mean 90th percentile	2.8	revised mean 90th percentile	2.7	revised mean 90th percentile	2.5	revised mean 90th percentile	1.9			
	Cmax	4.3	Cmax	3.7	Cmax	3.2	Cmax	2.8	Cmax	2.7			
	excel percentile	1.9	excel percentile	2.6	excel percentile	2.7	excel percentile	2.4	excel percentile	1.8			
Rank	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	
1.0	699-23-34A	0	699-24-35	0	699-23-34A	0	699-26-35A	0	699-26-35A	0	699-26-35A	0	
2.0	699-24-35	0	699-23-34A	0	699-26-35A	0	699-24-35	0	699-24-35	0	699-24-35	0	
3.0	699-22-35	3.61E-09	699-22-35	9.93E-08	699-24-35	0	699-23-34A	0	699-23-34A	0	699-23-34A	0	
4.0	699-32-43	0.050	699-24-34C	0.060	699-22-35	2.74E-07	699-22-35	4.74E-07	699-22-35	7.38E-07			
5.0	699-24-34C	0.067	699-24-33	0.072	699-24-34C	0.052	699-24-34C	0.044	699-24-34C	0.043			
6.0	699-24-33	0.079	699-32-43	0.11	699-24-33	0.062	699-24-33	0.054	699-24-33	0.052			
7.0	699-26-35A	0.15	699-26-35A	0.12	699-32-43	0.075	699-32-43	0.079	699-32-43	0.096			
8.0	699-26-34A	0.16	699-26-34A	0.16	699-26-34A	0.11	699-26-34A	0.100	699-26-34A	0.10			
9.0	699-26-33	0.18	699-25-34A	0.18	699-26-33	0.12	699-25-34A	0.11	699-25-34A	0.10			
10	699-25-34A	0.19	699-25-34B	0.18	699-25-34A	0.12	699-25-34B	0.11	699-25-34B	0.10			
11	699-25-34B	0.19	699-26-33	0.18	699-25-34B	0.12	699-26-33	0.11	699-26-33	0.11			
12	699-37-4	0.19	699-34-42	0.29	699-34-42	0.20	699-34-42	0.13	699-34-42	0.12			
13	Stream Tube Location E5	0.20	699-37-4	0.50	Stream Tube Location E1	0.82	Stream Tube Location E1	0.80	699-26-15A	0.80			
14	Stream Tube Location E4	0.23	Stream Tube Location E5	0.53	699-26-15A	0.83	699-26-15A	0.81	Stream Tube Location E1	0.81			
15	Stream Tube Location SE6	0.31	Stream Tube Location E4	0.61	699-37-4	0.86	699-37-4	0.98	699-20-20	0.95			
16	699-29-4	0.32	699-29-4	0.74	Stream Tube Location E5	0.88	Stream Tube Location E5	0.99	699-29-4	0.96			
17	699-20-E12O	0.38	699-26-15A	0.76	Stream Tube Location E4	0.92	699-29-4	0.99	Stream Tube Location E4	0.97			
18	Stream Tube Location NE6	0.47	699-32-33A	0.80	699-29-4	0.96	Stream Tube Location E4	0.99	Stream Tube Location E5	0.98			
19	699-41-1A	0.48	Stream Tube Location E1	0.83	699-32-33A	1.1	699-20-20	1.1	699-37-4	0.98			
20	Stream Tube Location NE4	0.58	Stream Tube Location SE6	1.1	699-20-20	1.2	Stream Tube Location NE2	1.3	Stream Tube Location SE2	1.1			
21	699-20-E5A	0.59	699-20-E12O	1.1	Stream Tube Location SE2	1.4	Stream Tube Location SE2	1.3	Stream Tube Location NE2	1.2			
22	699-34-42	0.70	699-20-E5A	1.3	Stream Tube Location SE6	1.4	699-32-33A	1.4	699-21-6	1.3			
23	Stream Tube Location E1	0.72	Stream Tube Location NE6	1.3	699-20-E12O	1.4	699-21-6	1.4	699-20-E5A	1.3			
24	699-21-6	0.90	699-20-20	1.3	699-20-E5A	1.5	699-20-E5A	1.4	699-35-9	1.3			
25	699-26-15A	0.94	699-21-6	1.4	699-21-6	1.5	699-20-E12O	1.5	699-20-E12O	1.4			
26	699-35-9	1.1	699-41-1A	1.5	Stream Tube Location NE2	1.7	Stream Tube Location SE6	1.5	Stream Tube Location SE6	1.4			
27	699-32-33A	1.2	Stream Tube Location SE2	1.6	CMAX S2	2.0	699-35-9	1.8	699-32-33A	1.4			
28	699-20-20	1.6	CMAX S2	2.0	CMAX Stream Tubes	2.6	CMAX S2	1.9	Stream Tube Location NE4	1.5			
29	Stream Tube Location SE2	1.7	Stream Tube Location NE4	2.0	Stream Tube Location NE6	2.6	Stream Tube Location NE4	2.2	699-41-1A	1.7			
30	CMAX S2	2.0	699-35-9	2.7	699-41-1A	2.7	CMAX Stream Tubes	2.4	Stream Tube Location NE6	1.8			
31	CMAX Stream Tubes	2.9	CMAX Stream Tubes	2.8	699-35-9	2.7	699-41-1A	2.5	CMAX S2	1.9			
32	Stream Tube Location NE2	3.0	Stream Tube Location NE2	2.8	Stream Tube Location NE4	2.8	Stream Tube Location NE6	2.6	CMAX Stream Tubes	2.1			
33	CMAX S1	4.3	CMAX S1	3.7	CMAX S1	3.2	CMAX S1	2.8	CMAX S1	2.7			

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Far-Field Exposure Area

Iodine-129, cont.	SUBAREA	Far Field	SUBAREA	Far Field								
	TIME (years)	150 year out	TIME (years)	175 year out	TIME (years)	200 year out	TIME (years)	300 year out	TIME (years)	400 year out		
	detects	30	detects	30								
	nondetects	3.0	nondetects	3.0								
	n (number of values)	33	n (number of values)	33								
	p (percentile)	90	p (percentile)	90								
	k (position in sequence)	30.6	k (position in sequence)	30.6								
	revised mean 90th percentile	1.4	revised mean 90th percentile	1.4	revised mean 90th percentile	1.4	revised mean 90th percentile	1.1	revised mean 90th percentile	0.84	revised mean 90th percentile	0.84
	Cmax	2.6	Cmax	2.5	Cmax	2.3	Cmax	1.9	Cmax	2.7	Cmax	2.7
	excel percentile	1.4	excel percentile	1.4	excel percentile	1.4	excel percentile	1.1	excel percentile	0.74	excel percentile	0.74
Rank	Row Labels	Max of CONC	Row Labels	Max of CONC								
1	699-26-35A	0	699-23-34A	0								
2	699-24-35	0	699-26-35A	0	699-26-35A	0	699-24-35	0	699-24-35	0	699-24-35	0
3	699-23-34A	0	699-24-35	0	699-24-35	0	699-26-35A	0	699-26-35A	0	699-26-35A	0
4	699-22-35	1.06E-06	699-22-35	1.44E-06	699-22-35	1.90E-06	699-22-35	4.17E-06	699-22-35	6.23E-06		
5	699-24-34C	0.041	699-24-34C	0.041	699-24-34C	0.041	699-24-34C	0.045	699-24-34C	0.041		
6	699-24-33	0.050	699-24-33	0.050	699-24-33	0.050	699-24-33	0.055	699-24-33	0.052		
7	699-25-34A	0.11	699-25-34B	0.11	699-25-34B	0.12	699-25-34B	0.15	699-25-34B	0.14		
8	699-25-34B	0.11	699-25-34A	0.11	699-25-34A	0.12	699-25-34A	0.15	699-25-34A	0.14		
9	699-26-34A	0.11	699-26-34A	0.12	699-26-34A	0.13	699-26-33	0.17	699-26-20	0.16		
10	699-32-43	0.11	699-26-33	0.12	699-26-33	0.13	699-26-34A	0.17	699-26-33	0.17		
11	699-26-33	0.11	699-34-42	0.12	699-34-42	0.13	699-34-42	0.18	699-26-34A	0.17		
12	699-34-42	0.12	699-32-43	0.13	699-32-43	0.14	699-32-43	0.21	699-34-42	0.18		
13	699-26-15A	0.82	699-20-20	0.71	699-20-20	0.61	699-20-20	0.32	SE2	0.21		
14	699-20-20	0.83	699-26-15A	0.84	SE2	0.76	SE2	0.40	699-32-43	0.21		
15	Stream Tube Location E1	0.84	Stream Tube Location E1	0.85	Stream Tube Location E1	0.84	699-21-6	0.51	699-21-6	0.26		
16	699-29-4	0.93	SE2	0.88	699-26-15A	0.84	699-32-22A	0.54	699-32-22A	0.28		
17	Stream Tube Location E4	0.94	699-29-4	0.89	699-29-4	0.87	699-20-E5A	0.54	699-20-E5A	0.28		
18	Stream Tube Location E5	0.94	Stream Tube Location E4	0.90	Stream Tube Location E4	0.88	699-20-E12O	0.56	699-20-E12O	0.29		
19	699-37-E4	0.95	E5	0.91	E5	0.88	SE6	0.57	SE6	0.30		
20	Stream Tube Location SE2	1.0	699-37-E4	0.91	699-37-E4	0.88	Stream Tube Location E1	0.65	Stream Tube Location NE2	0.39		
21	699-21-6	1.2	699-21-6	1.0	699-21-6	0.92	699-26-15A	0.70	Stream Tube Location E1	0.45		
22	699-20-E5A	1.2	699-20-E5A	1.1	699-20-E5A	0.96	NE2	0.80	699-35-9	0.47		
23	699-20-E12O	1.2	699-20-E12O	1.1	699-20-E12O	0.99	699-29-4	0.84	699-26-15A	0.49		
24	Stream Tube Location SE6	1.2	Stream Tube Location SE6	1.1	Stream Tube Location SE6	1.0	Stream Tube Location E4	0.84	Stream Tube Location NE4	0.52		
25	699-35-9	1.3	699-32-22A	1.3	699-32-22A	1.1	E5	0.84	699-41-1A	0.55		
26	Stream Tube Location NE4	1.3	Stream Tube Location NE6	1.3	Stream Tube Location NE6	1.3	699-37-E4	0.84	Stream Tube Location NE6	0.56		
27	699-41-1A	1.3	699-41-1A	1.3	699-41-1A	1.3	699-35-9	0.95	699-29-4	0.72		
28	Stream Tube Location NE2	1.3	Stream Tube Location NE4	1.3	Stream Tube Location NE2	1.3	Stream Tube Location NE4	1.0	Stream Tube Location E4	0.73		
29	Stream Tube Location NE6	1.4	699-35-9	1.3	Stream Tube Location NE4	1.4	699-41-1A	1.1	Stream Tube Location E5	0.74		
30	699-32-22A	1.4	NE2	1.4	699-35-9	1.4	NE6	1.1	699-37-E4	0.74		
31	CMAX Stream Tubes	1.4	CMAX Stream Tubes	1.4	CMAX Stream Tubes	1.4	CMAX Stream Tubes	1.2	CMAX Stream Tubes	0.93		
32	CMAX_S2	1.9	CMAX_S2	1.8	CMAX_S2	1.8	CMAX_S2	1.6	CMAX_S2	1.3		
33	CMAX_S1	2.6	CMAX_S1	2.5	CMAX_S1	2.3	CMAX_S1	1.9	CMAX_S1	2.7		

$$K = \frac{p(n+1)}{100}$$

$$90\text{th percentile} = \frac{k_{\text{rounded down}} + k_{\text{rounded up}}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Far-Field Exposure Area

Iodine-129, cont.		SUBAREA	Far Field	SUBAREA	Far Field								
		TIME (years)	500 year out	TIME (years)	600 year out	TIME (years)	700 year out	TIME (years)	800 year out	TIME (years)	900 year out		
	detects	30	detects	30									
	nondetects	3.0	nondetects	3.0									
	n (number of values)	33	n (number of values)	33									
	p (percentile)	90	p (percentile)	90									
	k (position in sequence)	30.6	k (position in sequence)	30.6									
	revised mean 90th percentile	0.71	revised mean 90th percentile	0.56	revised mean 90th percentile	0.43	revised mean 90th percentile	0.33	revised mean 90th percentile	0.26	revised mean 90th percentile	0.26	
	Cmax	2.8	Cmax	1.7	Cmax	1.0	Cmax	1.1	Cmax	1.2	Cmax	1.2	
	excel percentile	0.57	excel percentile	0.41	excel percentile	0.31	excel percentile	0.24	excel percentile	0.24	excel percentile	0.19	
Rank	Row Labels	Max of CONC	Row Labels	Max of CONC									
1	699-26-35A	0	699-26-35A	0	699-26-35A	0	699-26-35A	0	699-24-35	0	699-24-35	0	
2	699-24-35	0	699-24-35	0	699-24-35	0	699-24-35	0	699-23-34A	0	699-23-34A	0	
3	699-23-34A	0	699-23-34A	0	699-23-34A	0	699-23-34A	0	699-26-35A	0	699-26-35A	0	
4	699-22-35	7.40E-06	699-22-35	7.56E-06	699-22-35	6.91E-06	699-22-35	5.83E-06	699-22-35	4.74E-06			
5	699-24-34C	0.034	699-24-34C	0.027	699-24-34C	0.022	699-20-20	0.017	699-20-20	0.011			
6	699-24-33	0.042	699-24-33	0.034	699-24-33	0.027	699-24-34C	0.017	Stream Tube Location SE2	0.013			
7	699-20-20	0.088	699-20-20	0.049	699-20-20	0.029	Stream Tube Location SE2	0.021	699-24-34C	0.014			
8	Stream Tube Location SE2	0.11	Stream Tube Location SE2	0.061	Stream Tube Location SE2	0.035	699-24-33	0.022	699-21-6	0.015			
9	699-25-34A	0.11	699-21-6	0.075	699-21-6	0.042	699-21-6	0.025	699-20-E5A	0.016			
10	699-25-34B	0.11	699-20-E5A	0.080	699-20-E5A	0.045	699-20-E5A	0.026	699-20-E12O	0.016			
11	699-26-33	0.13	699-20-E12O	0.083	699-20-E12O	0.047	699-20-E12O	0.027	Stream Tube Location SE6	0.017			
12	699-26-34A	0.14	Stream Tube Location SE6	0.084	Stream Tube Location SE6	0.047	Stream Tube Location SE6	0.027	699-24-33	0.017			
13	699-21-6	0.14	699-25-34A	0.091	699-25-34A	0.075	699-25-34A	0.061	699-25-34A	0.047			
14	699-34-42	0.14	699-25-34B	0.091	699-25-34B	0.075	699-25-34B	0.061	699-25-34B	0.047			
15	699-20-E5A	0.15	699-34-42	0.11	699-34-42	0.084	699-34-42	0.068	699-34-42	0.052			
16	699-20-E12O	0.15	699-26-33	0.11	699-26-33	0.090	699-26-33	0.072	699-26-33	0.056			
17	Stream Tube Location SE6	0.16	699-26-34A	0.11	699-26-34A	0.091	699-26-34A	0.074	699-26-34A	0.057			
18	699-32-43	0.18	699-32-43	0.14	699-32-43	0.12	699-32-43	0.096	699-32-43	0.073			
19	699-32-22A	0.20	699-32-22A	0.18	699-32-22A	0.17	699-32-22A	0.15	699-32-22A	0.12			
20	Stream Tube Location NE2	0.23	Stream Tube Location NE2	0.19	Stream Tube Location NE2	0.18	Stream Tube Location NE2	0.16	Stream Tube Location E1	0.13			
21	699-35-9	0.26	699-35-9	0.20	699-35-9	0.18	699-35-9	0.16	Stream Tube Location NE2	0.13			
22	Stream Tube Location NE4	0.27	Stream Tube Location NE4	0.20	Stream Tube Location NE4	0.18	Stream Tube Location E1	0.16	699-26-15A	0.14			
23	699-41-1A	0.29	699-41-1A	0.20	699-41-1A	0.18	Stream Tube Location NE4	0.17	699-35-9	0.14			
24	Stream Tube Location NE6	0.29	Stream Tube Location NE6	0.20	Stream Tube Location NE6	0.18	699-41-1A	0.17	Stream Tube Location NE4	0.14			
25	Stream Tube Location E1	0.32	Stream Tube Location E1	0.25	Stream Tube Location E1	0.20	Stream Tube Location NE6	0.17	699-41-1A	0.15			
26	699-26-15A	0.34	699-26-15A	0.26	699-26-15A	0.21	699-26-15A	0.17	Stream Tube Location NE6	0.15			
27	699-29-4	0.54	699-29-4	0.40	699-29-4	0.30	699-29-4	0.23	699-29-4	0.19			
28	Stream Tube Location E4	0.56	Stream Tube Location E4	0.41	Stream Tube Location E4	0.30	Stream Tube Location E4	0.24	Stream Tube Location E4	0.19			
29	Stream Tube Location E5	0.57	Stream Tube Location E5	0.41	Stream Tube Location E5	0.31	Stream Tube Location E5	0.24	Stream Tube Location E5	0.19			
30	699-37-E4	0.57	699-37-E4	0.41	699-37-E4	0.31	699-37-E4	0.24	699-37-E4	0.19			
31	CMAX Stream Tubes	0.84	CMAX Stream Tubes	0.70	CMAX Stream Tubes	0.54	CMAX Stream Tubes	0.42	CMAX Stream Tubes	0.32			
32	CMAX_S2	1.1	CMAX_S2	0.90	CMAX_S2	0.74	CMAX_S2	0.62	CMAX_S2	0.52			
33	CMAX_S1	2.8	CMAX_S1	1.7	CMAX_S1	1.0	CMAX_S1	1.1	CMAX_S1	1.2			

$$K = \frac{p(n+1)}{100}$$

$$90\text{th percentile} = \frac{k_{\text{rounded down}} + k_{\text{rounded up}}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Far-Field Exposure Area

Iodine-129, cont.

	SUBAREA	Far Field
TIME (years)		1000 year out
detects		30
nondetects		3.0
n (number of values)		33
p (percentile)		90
k (position in sequence)		30.6
revised mean 90th percentile		1.4
Cmax		1.4
excel percentile		0.16
Rank	Row Labels	Max of CONC
1	699-24-35	0
2	699-23-34A	0
3	699-26-35A	0
4	699-22-35	3.77E-06
5	699-20-20	0.0070
6	Stream Tube Location SE2	0.0082
7	699-21-6	0.0096
8	699-20-E5A	0.0100
9	699-24-34C	0.010
10	699-20-E12O	0.010
11	Stream Tube Location SE6	0.010
12	699-24-33	0.013
13	699-25-34A	0.036
14	699-25-34B	0.036
15	699-34-42	0.039
16	699-26-33	0.042
17	699-26-34A	0.043
18	699-32-43	0.055
19	699-32-22A	0.10
20	Stream Tube Location E1	0.11
21	Stream Tube Location NE2	0.11
22	699-26-15A	0.11
23	699-35-9	0.12
24	Stream Tube Location NE4	0.12
25	699-41-1A	0.12
26	Stream Tube Location NE6	0.12
27	699-29-4	0.15
28	Stream Tube Location E4	0.15
29	Stream Tube Location E5	0.15
30	699-37-E4	0.16
31	CMAX Stream Tubes	0.25
32	CMAX_S2	0.45
33	CMAX_S1	1.4

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounded\ down} + k_{rounded\ up}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Far-Field Exposure Area

PCE	SUBAREA	Far Field		SUBAREA	Far Field		SUBAREA	Far Field		SUBAREA	Far Field		SUBAREA	Far Field	
	TIME (year)	25 year out		TIME (year)	50 years out		TIME (year)	75 years out		TIME (year)	100 years out		TIME (year)	125 years out	
	detects	31		detects	31		detects	30		detects	30		detects	30	
	nondetects	2.0		nondetects	2.0		nondetects	3.0		nondetects	3.0		nondetects	3.0	
	n (number of values)	33		n (number of values)	33		n (number of values)	33		n (number of values)	33		n (number of values)	33	
	p (percentile)	90		p (percentile)	90		p (percentile)	90		p (percentile)	90		p (percentile)	90	
	k (position in sequence)	30.6		k (position in sequence)	30.6		k (position in sequence)	30.6		k (position in sequence)	30.6		k (position in sequence)	30.6	
	revised mean 90th percentile	0.14		revised mean 90th percentile	0.066		revised mean 90th percentile	0.045		revised mean 90th percentile	0.049		revised mean 90th percentile	0.054	
	Cmax	0.59		Cmax	0.33		Cmax	0.23		Cmax	0.18		Cmax	0.14	
	excel percentile	0.12		excel percentile	0.058		excel percentile	0.039		excel percentile	0.030		excel percentile	0.033	
Rank	Row Labels	Max of CONC		Row Labels	Max of CONC		Row Labels	Max of CONC		Row Labels	Max of CONC		Row Labels	Max of CONC	
1	699-23-34A	0		699-23-34A	0		699-26-35A	0		699-26-35A	0		699-26-35A	0	
2	699-24-35	0		699-24-35	0		699-23-34A	0		699-23-34A	0		699-24-35	0	
3	Stream Tube Location NE6	1.47E-32		Stream Tube Location NE6	2.43E-17		Stream Tube Location NE6	8.98E-11		Stream Tube Location NE6	1.04E-07		Stream Tube Location NE6	4.01E-07	
4	699-41-1A	2.08E-30		699-41-1A	6.93E-16		699-41-1A	4.74E-10		699-41-1A	2.60E-07		699-32-43	2.31E-06	
5	Stream Tube Location NE4	4.28E-28		Stream Tube Location NE4	3.21E-14		Stream Tube Location NE4	4.15E-09		Stream Tube Location NE4	9.78E-07		Stream Tube Location NE6	4.55E-06	
6	699-35-9	9.81E-25		699-35-9	3.86E-12		Stream Tube Location NE4	6.39E-08		Stream Tube Location NE4	9.80E-07		699-41-1A	7.76E-06	
7	699-37-4	3.16E-23		699-37-4	2.96E-11		699-35-9	2.26E-07		699-35-9	5.29E-06		699-26-34A	1.05E-05	
8	Stream Tube Location E5	3.21E-22		Stream Tube Location E5	7.18E-11		Stream Tube Location E5	3.38E-07		699-32-43	5.60E-06		Stream Tube Location NE4	1.79E-05	
9	Stream Tube Location E4	3.26E-21		Stream Tube Location E4	1.66E-10		Stream Tube Location E4	4.97E-07		699-26-34A	1.54E-05		699-35-9	5.16E-05	
10	699-29-4	1.80E-19		699-29-4	6.44E-10		699-29-4	9.50E-07		699-37-4	1.66E-05		699-26-33	1.63E-04	
11	Stream Tube Location SE6	6.04E-18		Stream Tube Location SE6	1.48E-08		699-29-4	2.60E-06		Stream Tube Location E5	2.06E-05		699-37-4	1.81E-04	
12	699-20-E12O	3.13E-16		Stream Tube Location NE2	3.22E-08		699-34-42	7.68E-06		Stream Tube Location E4	2.55E-05		Stream Tube Location E5	2.06E-04	
13	Stream Tube Location NE2	7.79E-16		699-20-E12O	5.49E-08		699-32-43	1.48E-05		699-29-4	3.67E-05		Stream Tube Location E4	2.33E-04	
14	699-20-E5A	3.16E-13		699-20-E5A	6.83E-07		699-32-43	1.11E-06		Stream Tube Location SE6	1.81E-05		Stream Tube Location NE2	8.07E-05	
15	699-26-15A	3.51E-12		699-26-15A	7.24E-06		699-26-34A	2.74E-05		699-26-33	2.25E-04		699-29-4	2.90E-04	
16	699-21-6	4.89E-10		699-34-42	6.99-21-6		699-20-E12O	3.33E-05		699-32-33A	5.07E-04		699-32-33A	5.31E-04	
17	Stream Tube Location E1	9.57E-08		699-21-6	1.13E-05		699-26-15A	8.45E-05		699-32-33A	6.47E-04		699-25-34B	8.40E-04	
18	Stream Tube Location SE2	6.51E-07		699-32-43	4.11E-05		699-20-E5A	1.16E-04		699-26-15A	6.68E-04		699-25-34A	8.40E-04	
19	699-32-33A	7.06E-07		Stream Tube Location E1	6.08E-05		699-20-E5A	3.01E-04		699-20-E12O	7.00E-04		699-26-15A	0.0021	
20	699-34-42	1.36E-05		699-26-34A	6.58E-05		699-26-33	4.82E-04		699-25-34B	0.0012		Stream Tube Location SE6	0.0030	
21	699-20-20	7.47E-05		699-32-33A	1.64E-04		699-21-6	5.47E-04		699-25-34A	0.0012		699-20-E12O	0.0037	
22	699-32-43	7.68E-05		Stream Tube Location SE2	3.86E-04		699-32-33A	6.77E-04		699-20-E5A	0.0014		Stream Tube Location E1	0.0043	
23	699-26-34A	1.46E-04		699-26-33	4.43E-04		Stream Tube Location E1	0.0016		699-25-34A	0.0022		699-20-E5A	0.0055	
24	699-26-33	7.13E-04		699-26-35A	0.0012		699-25-34A	0.0016		699-21-6	0.0031		699-21-6	0.0089	
25	699-26-35A	0.0010		699-25-34A	0.0021		699-25-34B	0.0016		699-20-E5A	0.0012		699-24-34C	0.013	
26	CMAX Stream Tubes	0.0021		699-25-34B	0.0021		Stream Tube Location SE2	0.0040		699-24-34C	0.020		699-22-35	0.015	
27	699-25-34B	0.0024		699-20-20	0.0034		699-20-20	0.013		699-24-34C	0.024		Stream Tube Location SE2	0.023	
28	699-25-34A	0.0024		CMAX Stream Tubes	0.024		699-24-34C	0.029		699-22-35	0.039		CMAX S1b	0.025	
29	699-24-34C	0.054		699-24-34C	0.045		699-22-35	0.039		699-20-20	0.025		CMAX S1b	0.031	
30	CMAX S1b	0.13		CMAX S1b	0.061		CMAX S1b	0.040		CMAX S1b	0.067		CMAX Stream Tubes	0.073	
31	699-22-35	0.15		699-22-35	0.071		CMAX Stream Tubes	0.050		699-24-33	0.13		CMAX Stream Tubes	0.087	
32	699-24-33	0.56		699-24-33	0.33		699-24-33	0.21		699-24-33	0.18		CMAX S2	0.14	
33	CMAX S2	0.59		CMAX S2	0.33		CMAX S2	0.23		CMAX S2	0.18		CMAX S2	0.14	

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001
Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Far-Field Exposure Area

Tritium	SUBAREA	Far Field	SUBAREA	Far Field	SUBAREA	Far Field						
	TIME (year)	25 years out	TIME (year)	50 years out	TIME (year)	75 years out	TIME (year)	100 years out	TIME (year)	125 years out	TIME (year)	
	detects	31	detects	31	detects	30	detects	30	detects	30	detects	30
	nondetects	2.0	nondetects	2.0	nondetects	3.0	nondetects	3.0	nondetects	3.0	nondetects	3.0
	n (number of values)	33	n (number of values)	33	n (number of values)	33						
	p (percentile)	90	p (percentile)	90	p (percentile)	90						
	k (position in sequence)	30.6	k (position in sequence)	30.6	k (position in sequence)	30.6						
	revised mean 90th percentile	52,239	revised mean 90th percentile	12,890	revised mean 90th percentile	1,903	revised mean 90th percentile	257	revised mean 90th percentile	37	revised mean 90th percentile	37
	Cmax	108,490	Cmax	20,904	Cmax	7,864	Cmax	1,766	Cmax	270	Cmax	270
	excel percentile	48,388	excel percentile	12,430	excel percentile	1,769	excel percentile	240	excel percentile	34	excel percentile	34
Rank	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC						
1	699-23-34A	0	699-23-34A	0	699-24-35	0	699-24-35	0	699-24-35	0	699-24-35	0
2	699-24-35	0	699-24-35	0	699-26-35A	0	699-26-35A	0	699-26-35A	0	699-26-35A	0
3	699-22-35	7.61E-04	699-22-35	8.44E-04	699-23-34A	0	699-23-34A	0	699-23-34A	0	699-23-34A	0
4	699-24-34C	217	699-24-34C	48	699-22-35	3.56E-04	699-22-35	1.34E-04	699-22-35	4.70E-05	699-24-34C	0.67
5	699-24-33	267	699-24-33	59	699-24-34C	12	699-24-34C	2.9	699-24-34C	0.67	699-24-34C	0.67
6	699-26-35A	631	699-26-35A	103	699-24-33	15	699-24-33	3.5	699-24-33	0.83	699-24-33	0.83
7	699-25-34A	843	699-25-34A	184	699-25-34A	45	699-25-34A	10	699-25-34A	2.3	699-25-34A	2.3
8	699-25-34B	843	699-25-34B	184	699-25-34B	45	699-25-34B	10	699-25-34B	2.3	699-25-34B	2.3
9	699-26-34A	913	699-26-34A	212	699-26-34A	53	699-26-33	12	699-26-33	2.7	699-26-33	2.7
10	699-26-33	943	699-26-33	214	699-26-33	53	699-26-34A	12	699-26-34A	2.7	699-26-34A	2.7
11	699-32-43	994	699-32-43	257	699-34-42	63	699-34-42	14	699-34-42	3.1	699-34-42	3.1
12	699-34-42	1,501	699-34-42	277	699-32-43	65	699-32-43	15	699-20-20	3.3	699-20-20	3.3
13	CMAX S2	7,716	699-20-20	1,312	699-20-20	177	699-20-20	24	699-32-43	3.4	699-32-43	3.4
14	Stream Tube Location SE6	8,767	699-32-33A	1,338	699-32-33A	179	699-32-33A	27	699-32-33A	4.7	699-32-33A	4.7
15	699-20-E12O	9,183	CMAX S2	1,682	Stream Tube Location SE2	293	Stream Tube Location SE2	40	Stream Tube Location SE2	5.5	Stream Tube Location SE2	5.5
16	699-20-20	9,184	Stream Tube Location SE2	2,026	Stream Tube Location E1	310	Stream Tube Location E1	46	Stream Tube Location E1	7.8	Stream Tube Location E1	7.8
17	699-20-E5A	10,131	Stream Tube Location E1	2,114	CMAX S2	366	699-26-15A	65	699-26-15A	10	699-26-15A	10
18	699-32-33A	10,397	699-21-6	2,654	699-26-15A	446	699-21-6	78	699-21-6	12	699-21-6	12
19	699-21-6	11,137	699-20-E5A	2,774	699-21-6	487	CMAX S2	84	699-20-E5A	14	699-20-E5A	14
20	Stream Tube Location SE2	12,064	699-20-E12O	2,804	699-20-E5A	547	699-20-E5A	91	Stream Tube Location NE2	14	Stream Tube Location NE2	14
21	Stream Tube Location E1	12,868	Stream Tube Location SE6	2,805	699-20-E12O	584	Stream Tube Location NE2	99	699-20-E12O	16	699-20-E12O	16
22	699-26-15A	14,519	699-26-15A	2,821	Stream Tube Location SE6	599	699-20-E12O	100	Stream Tube Location SE6	16	Stream Tube Location SE6	16
23	699-29-4	18,126	699-29-4	3,772	Stream Tube Location NE2	689	Stream Tube Location SE6	104	CMAX S2	19	CMAX S2	19
24	Stream Tube Location E4	18,368	Stream Tube Location E4	3,828	699-29-4	739	699-29-4	127	699-29-4	20	699-29-4	20
25	Stream Tube Location E5	18,449	Stream Tube Location E5	3,848	Stream Tube Location E4	757	Stream Tube Location E4	132	Stream Tube Location E4	21	Stream Tube Location E4	21
26	699-37-4	18,574	699-37-4	3,879	Stream Tube Location E5	765	Stream Tube Location E5	134	Stream Tube Location E5	21	Stream Tube Location E5	21
27	Stream Tube Location NE6	34,631	Stream Tube Location NE2	4,753	699-37-4	775	699-37-4	136	699-37-4	22	699-37-4	22
28	Stream Tube Location NE2	37,904	699-35-9	8,926	699-35-9	1,152	699-35-9	164	699-35-9	24	699-35-9	24
29	699-41-1A	39,980	Stream Tube Location NE4	11,477	Stream Tube Location NE4	1,537	Stream Tube Location NE4	212	Stream Tube Location NE4	30	Stream Tube Location NE4	30
30	Stream Tube Location NE4	50,490	699-41-1A	12,668	699-41-1A	1,827	699-41-1A	247	699-41-1A	35	699-41-1A	35
31	CMAX Stream Tubes	53,988	Stream Tube Location NE6	13,111	Stream Tube Location NE6	1,980	Stream Tube Location NE6	266	Stream Tube Location NE6	38	Stream Tube Location NE6	38
32	699-35-9	60,760	CMAX S1b	19,165	CMAX S1b	2,950	CMAX S1b	424	CMAX S1b	66	CMAX S1b	66
33	CMAX S1b	108,490	CMAX Stream Tubes	20,904	CMAX Stream Tubes	7,864	CMAX Stream Tubes	1,766	CMAX Stream Tubes	270	CMAX Stream Tubes	270

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Far-Field Exposure Area

Nitrate	SUBAREA	Far Field	SUBAREA	Far Field	SUBAREA	Far Field						
	TIME (year)	25 years out	TIME (year)	50 years out	TIME (year)	75 years out	TIME (year)	100 years out	TIME (year)	125 years out	TIME (year)	125 years out
	detects	31	detects	31	detects	30	detects	30	detects	30	detects	30
	nondetects	2.0	nondetects	2.0	nondetects	3.0	nondetects	3.0	nondetects	3.0	nondetects	3.0
	n (number of values)	33	n (number of values)	33	n (number of values)	33						
	p (percentile)	90	p (percentile)	90	p (percentile)	90						
	k (position in sequence)	30.6	k (position in sequence)	30.6	k (position in sequence)	30.6						
	revised mean 90th percentile	35,502	revised mean 90th percentile	34,354	revised mean 90th percentile	29,161	revised mean 90th percentile	20,986	revised mean 90th percentile	13,694	revised mean 90th percentile	13,694
	Cmax	70,017	Cmax	64,706	Cmax	61,535	Cmax	58,574	Cmax	55,816	Cmax	55,816
	excel percentile	35,228	excel percentile	34,111	excel percentile	28,479	excel percentile	20,265	excel percentile	13,148	excel percentile	13,148
Rank	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC						
1	699-24-35	0	699-23-34A	0	699-26-35A	0	699-26-35A	0	699-24-35	0	699-24-35	0
2	699-23-34A	0	699-24-35	0	699-24-35	0	699-24-35	0	699-26-35A	0	699-26-35A	0
3	699-24-34C	1,934	699-22-35	657	699-23-34A	0	699-23-34A	0	699-23-34A	0	699-23-34A	0
4	699-22-35	1,956	699-24-34C	1,071	699-22-35	261	699-22-35	112	699-22-35	51	699-24-34C	447
5	699-26-35A	2,907	699-26-35A	1,130	699-24-34C	704	699-24-34C	537	699-24-34C	447	699-24-34C	447
6	699-25-34A	3,782	699-25-34B	2,034	699-24-33	1,473	699-24-33	890	699-24-33	589	699-24-33	589
7	699-25-34B	3,782	699-25-34A	2,034	699-25-34A	1,696	699-25-34A	1,526	699-25-34A	1,366	699-25-34A	1,366
8	699-26-33	4,349	699-26-33	2,386	699-25-34B	1,696	699-25-34B	1,526	699-25-34B	1,366	699-25-34B	1,366
9	699-26-34A	4,426	699-26-34A	2,400	699-26-33	2,007	699-26-33	1,831	699-26-33	1,634	699-26-33	1,634
10	699-24-33	5,210	699-24-33	2,640	699-26-34A	2,037	699-26-34A	1,864	699-26-34A	1,665	699-26-34A	1,665
11	699-32-43	5,688	699-32-43	3,019	699-34-42	2,460	699-34-42	2,179	699-34-42	1,872	699-34-42	1,872
12	699-34-42	6,320	699-34-42	3,108	699-32-43	2,642	699-32-43	2,424	699-32-43	2,144	699-32-43	2,144
13	CMAX S2	7,943	CMAX S2	4,825	CMAX S2	3,335	CMAX S2	2,509	CMAX S2	2,342	CMAX S2	2,342
14	Stream Tube Location NE2	12,889	699-32-33A	7,026	699-32-33A	5,166	699-32-33A	4,378	699-20-20	3,157	699-20-20	3,157
15	699-32-33A	13,705	699-35-9	13,592	699-20-20	9,389	699-20-20	5,391	699-32-33A	3,479	699-32-33A	3,479
16	699-35-9	17,302	Stream Tube Location NE2	14,108	Stream Tube Location E1	10,127	Stream Tube Location E1	6,125	Stream Tube Location E1	3,820	Stream Tube Location E1	3,820
17	Stream Tube Location E1	19,811	Stream Tube Location NE4	14,697	Stream Tube Location NE2	11,640	Stream Tube Location NE2	8,201	Stream Tube Location SE2	5,052	Stream Tube Location SE2	5,052
18	699-26-15A	22,534	Stream Tube Location E1	15,775	699-35-9	13,730	Stream Tube Location SE2	8,698	699-26-15A	5,302	699-26-15A	5,302
19	Stream Tube Location NE4	23,741	699-41-1A	16,140	699-26-15A	13,866	699-26-15A	8,724	Stream Tube Location NE2	6,046	Stream Tube Location NE2	6,046
20	699-20-20	27,046	699-20-20	16,486	Stream Tube Location NE4	13,910	699-35-9	11,162	699-35-9	8,016	699-35-9	8,016
21	699-41-1A	28,677	Stream Tube Location NE6	17,023	699-41-1A	13,962	Stream Tube Location NE4	12,417	Stream Tube Location NE4	9,295	Stream Tube Location NE4	9,295
22	Stream Tube Location NE6	31,163	699-26-15A	18,868	Stream Tube Location NE6	13,997	699-41-1A	13,019	699-41-1A	10,125	699-41-1A	10,125
23	Stream Tube Location SE2	32,486	Stream Tube Location SE2	24,133	Stream Tube Location SE2	14,908	Stream Tube Location NE6	13,269	699-21-6	10,311	699-21-6	10,311
24	699-29-4	33,070	699-29-4	25,499	699-29-4	20,364	699-29-4	15,360	699-29-4	10,418	699-29-4	10,418
25	Stream Tube Location E4	33,659	Stream Tube Location E4	26,039	Stream Tube Location E4	20,750	Stream Tube Location E4	15,790	Stream Tube Location NE6	10,531	Stream Tube Location NE6	10,531
26	Stream Tube Location E5	33,958	Stream Tube Location E5	26,334	Stream Tube Location E5	20,952	Stream Tube Location E5	16,016	Stream Tube Location E4	10,791	Stream Tube Location E4	10,791
27	699-37-4	34,260	699-37-4	26,647	699-37-4	21,163	699-37-4	16,250	Stream Tube Location E5	10,990	Stream Tube Location E5	10,990
28	699-20-E5A	34,924	699-21-6	31,953	699-21-6	24,330	699-21-6	16,344	699-37-4	11,200	699-37-4	11,200
29	699-21-6	34,950	699-20-E5A	33,541	699-20-E5A	27,085	699-20-E5A	18,845	699-20-E5A	12,090	699-20-E5A	12,090
30	699-20-E120	35,298	699-20-E120	34,254	699-20-E120	28,827	699-20-E120	20,620	699-20-E120	13,413	699-20-E120	13,413
31	Stream Tube Location SE6	35,705	CMAX Stream Tubes	34,453	Stream Tube Location SE6	29,494	Stream Tube Location SE6	21,352	Stream Tube Location SE6	13,974	Stream Tube Location SE6	13,974
32	CMAX Stream Tubes	37,744	Stream Tube Location SE6	34,465	CMAX Stream Tubes	30,652	CMAX Stream Tubes	24,769	CMAX Stream Tubes	17,906	CMAX Stream Tubes	17,906
33	CMAX S1b	70,017	CMAX S1b	64,706	CMAX S1b	61,535	CMAX S1b	58,574	CMAX S1b	55,816	CMAX S1b	55,816

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down)th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Far-Field Exposure Area

Nitrate, cont.	time	150		time	175		time	200		time	300		time	400
	SUBAREA	Far Field		SUBAREA	Far Field		SUBAREA	Far Field		SUBAREA	Far Field		SUBAREA	Far Field
	detects	30		detects	30		detects	30		detects	30		detects	30
	nondetects	3.0		nondetects	3.0		nondetects	3.0		nondetects	3.0		nondetects	3.0
	n (number of values)	33		n (number of values)	33		n (number of values)	33		n (number of values)	33		n (number of values)	33
	p (percentile)	90		p (percentile)	90		p (percentile)	90		p (percentile)	90		p (percentile)	90
	k (position in sequence)	30.6		K (position in sequence)	30.6		k (position in sequence)	30.6		k (position in sequence)	30.6		k (position in sequence)	30.6
	revised mean 90th percentile	8,529		revised mean 90th percentile	5,624		revised mean 90th percentile	4,372		revised mean 90th percentile	2,258		revised mean 90th percentile	2,167
	Cmax	53,140		Cmax	50,541		Cmax	48,006		Cmax	38,535		Cmax	30,104
	excel percentile	8,204		excel percentile	5,489		excel percentile	4,251		excel percentile	2,227		excel percentile	2,163
Rank	Row Labels	Max of CONC		Row Labels	Max of CONC									
1	699-23-34A	0		699-23-34A	0									
2	699-26-35A	0		699-26-35A	0									
3	699-24-35	0		699-24-35	0		699-24-35	0		699-24-35	0		699-24-35	0
4	699-22-35	24		699-22-35	12		699-22-35	6		699-22-35	0.5		699-22-35	0.1
5	699-24-34C	380		699-24-34C	371		699-24-34C	390		699-20-20	133		699-20-20	55
6	699-24-33	483		699-24-33	465		699-24-33	487		Stream Tube Location SE2	178		Stream Tube Location SE2	63
7	699-25-34B	1,286		699-20-20	1,135		699-20-20	694		699-21-6	349		699-21-6	88
8	699-25-34A	1,286		699-25-34B	1,351		Stream Tube Location SE2	1,066		699-20-E5A	405		699-20-E5A	96
9	699-26-33	1,546		699-25-34A	1,351		699-25-34A	1,437		699-24-34C	417		699-20-E120	102
10	699-26-34A	1,581		699-26-33	1,632		699-25-34B	1,437		699-20-E120	448		Stream Tube Location SE6	104
11	699-34-42	1,799		699-26-34A	1,676		699-26-33	1,732		Stream Tube Location SE6	467		699-24-34C	273
12	699-20-20	1,880		Stream Tube Location SE2	1,767		Stream Tube Location E1	1,754		699-24-33	519		699-24-33	344
13	699-32-43	2,036		699-34-42	1,960		699-26-34A	1,778		699-25-34A	1,538		699-25-34A	988
14	CMAX_S2	2,226		Stream Tube Location E1	2,061		699-26-15A	1,952		699-25-34B	1,538		699-25-34B	988
15	Stream Tube Location E1	2,645		CMAX_S2	2,123		699-32-22A	2,104		699-29-4	1,610		699-26-33	1,186
16	699-32-22A	2,813		699-32-43	2,177		699-34-42	2,104		Stream Tube Location E4	1,611		699-26-34A	1,215
17	Stream Tube Location SE2	2,967		699-32-22A	2,387		CMAX_S2	2,155		Stream Tube Location E5	1,612		699-34-42	1,351
18	699-26-15A	3,397		699-26-15A	2,437		699-32-43	2,299		699-37-E4	1,613		Stream Tube Location E1	1,500
19	Stream Tube Location NE2	4,686		Stream Tube Location NE2	3,705		699-21-6	2,345		699-26-15A	1,627		699-32-43	1,533
20	699-35-9	5,934		699-21-6	3,855		699-20-E5A	2,773		Stream Tube Location E1	1,662		699-26-15A	1,566
21	699-21-6	6,334		699-29-4	4,283		699-29-4	2,943		699-26-33	1,851		699-29-4	1,645
22	699-29-4	6,661		Stream Tube Location E4	4,435		Stream Tube Location NE2	3,004		699-26-34A	1,899		Stream Tube Location E4	1,649
23	Stream Tube Location NE4	6,763		Stream Tube Location E5	4,518		Stream Tube Location E4	3,026		Stream Tube Location NE2	2,019		Stream Tube Location E5	1,651
24	Stream Tube Location E4	6,917		699-20-E5A	4,560		Stream Tube Location E5	3,071		699-35-9	2,050		699-37-E4	1,652
25	Stream Tube Location E5	7,056		699-35-9	4,598		699-20-E120	3,101		Stream Tube Location NE4	2,105		699-32-22A	1,941
26	699-37-E4	7,203		699-37-E4	4,606		699-37-E4	3,119		699-41-1A	2,149		CMAX_S2	2,032
27	699-41-1A	7,346		699-20-E120	5,099		Stream Tube Location SE6	3,243		699-32-22A	2,163		Stream Tube Location NE2	2,146
28	699-20-E5A	7,476		Stream Tube Location NE4	5,150		699-35-9	3,642		Stream Tube Location NE6	2,173		Stream Tube Location NE6	2,152
29	Stream Tube Location NE6	7,646		Stream Tube Location SE6	5,331		Stream Tube Location NE4	4,037		699-34-42	2,205		699-41-1A	2,156
30	699-20-E120	8,343		699-41-1A	5,528		699-41-1A	4,304		StreamTube_MAX	2,233		Stream Tube Location NE4	2,164
31	Stream Tube Location SE6	8,716		Stream Tube Location NE6	5,720		Stream Tube Location NE6	4,439		CMAX_S2	2,283		699-35-9	2,170
32	StreamTube_MAX	9,342		StreamTube_MAX	5,943		StreamTube_MAX	4,633		699-32-43	2,431		StreamTube_MAX	2,230
33	CMAX_S1b	53,140		CMAX_S1b	50,541		CMAX_S1b	48,006		CMAX_S1b	38,535		CMAX_S1b	30,104

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Far-Field Exposure Area

Nitrate, cont.

	time	500		time	600
	SUBAREA	Far Field		SUBAREA	Far Field
detects		30	detects		30
nondetects		3.0	nondetects		3.0
n (number of values)		33	n (number of values)		33
p (percentile)		90	p (percentile)		90
k (position in sequence)		30.6	k (position in sequence)		30.6
revised mean 90th percentile		1,882	revised mean 90th percentile		1,330
Cmax		22,951	Cmax		23,490
excel percentile		1,865	excel percentile		1,272
Rank	Row Labels	Max of CONC	Rank	Row Labels	Max of CONC
1	699-23-34A	0	1	699-23-34A	0
2	699-26-35A	0	2	699-24-35	0
3	699-24-35	0	3	699-26-35A	0
4	699-22-35	0.1	4	699-22-35	0.03
5	699-20-20	33	5	699-20-20	20
6	Stream Tube Location SE2	36	6	Stream Tube Location SE2	22
7	699-21-6	43	7	699-21-6	25
8	699-20-E5A	45	8	699-20-E5A	26
9	699-20-E120	46	9	699-20-E120	27
10	Stream Tube Location SE6	47	10	Stream Tube Location SE6	27
11	699-24-34C	173	11	699-24-34C	119
12	699-24-33	218	12	699-24-33	148
13	699-25-34A	622	13	699-25-34A	428
14	699-25-34B	622	14	699-25-34B	428
15	699-26-33	745	15	699-26-33	512
16	699-26-34A	762	16	699-26-34A	523
17	699-34-42	826	17	699-34-42	529
18	699-32-43	958	18	Stream Tube Location E1	651
19	Stream Tube Location E1	1,038	19	699-32-43	676
20	699-26-15A	1,113	20	699-26-15A	707
21	699-29-4	1,264	21	699-32-22A	785
22	Stream Tube Location E4	1,273	22	699-29-4	830
23	Stream Tube Location E5	1,278	23	Stream Tube Location E4	838
24	699-37-E4	1,284	24	Stream Tube Location E5	843
25	699-32-22A	1,302	25	699-37-E4	847
26	Stream Tube Location NE2	1,628	26	Stream Tube Location NE2	1,030
27	699-35-9	1,769	27	699-35-9	1,155
28	CMAX_S2	1,773	28	Stream Tube Location NE4	1,218
29	Stream Tube Location NE4	1,834	29	699-41-1A	1,257
30	699-41-1A	1,873	30	Stream Tube Location NE6	1,276
31	Stream Tube Location NE6	1,891	31	StreamTube_MAX	1,384
32	StreamTube_MAX	1,938	32	CMAX_S2	1,525
33	CMAX_S1b	22,951	33	CMAX_S1b	23,490

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Far-Field Exposure Area

CTET	SUBAREA	Far Field	SUBAREA	Far Field						
	TIME (year)	25 years out	TIME (year)	50 years out	TIME (year)	75 years out	TIME (year)	100 years out	TIME (year)	125 years out
	detects	31	detects	31	detects	30	detects	30	detects	30
	nondetects	2.0	nondetects	2.0	nondetects	3.0	nondetects	3.0	nondetects	3.0
	n (number of values)	33	n (number of values)	33						
	p (percentile)	90	p (percentile)	90						
	k (position in sequence)	30.6	k (position in sequence)	30.6						
	revised mean 90th percentile	0.063	revised mean 90th percentile	0.036	revised mean 90th percentile	0.034	revised mean 90th percentile	0.049	revised mean 90th percentile	0.065
	Cmax	0.28	Cmax	0.22	Cmax	0.26	Cmax	0.40	Cmax	0.49
	excel percentile	0.040	excel percentile	0.034	excel percentile	0.033	excel percentile	0.047	excel percentile	0.061
Rank	Row Labels	Max of CONC	Row Labels	Max of CONC						
1	699-24-35	0	699-24-35	0	699-23-34A	0	699-23-34A	0	699-23-34A	0
2	699-23-34A	0	699-23-34A	0	699-26-35A	0	699-26-35A	0	699-26-35A	0
3	Stream Tube Location NE6	1.32E-21	Stream Tube Location NE6	3.83E-10	Stream Tube Location NE6	8.10E-07	Stream Tube Location NE6	1.42E-05	Stream Tube Location NE6	9.62E-05
4	699-41-1A	9.10E-20	699-41-1A	1.56E-09	699-41-1A	1.43E-06	699-41-1A	1.91E-05	699-41-1A	1.29E-04
5	Stream Tube Location NE4	1.01E-17	Stream Tube Location NE4	1.04E-08	Stream Tube Location NE4	3.46E-06	Stream Tube Location NE4	3.25E-05	Stream Tube Location NE4	1.99E-04
6	699-35-9	3.99E-15	699-35-9	1.15E-07	Stream Tube Location NE4	1.07E-05	699-35-9	7.37E-05	Stream Tube Location NE4	2.19E-04
7	699-37-4	1.39E-14	699-37-4	1.94E-07	699-35-9	2.79E-05	699-37-4	3.54E-04	699-35-9	4.65E-04
8	Stream Tube Location E5	4.71E-14	Stream Tube Location E5	2.76E-07	Stream Tube Location E5	3.82E-07	Stream Tube Location E5	3.30E-05	Stream Tube Location E5	3.91E-04
9	Stream Tube Location E4	1.41E-13	Stream Tube Location E4	6.81E-07	Stream Tube Location E4	3.86E-05	Stream Tube Location E4	4.31E-04	Stream Tube Location E5	0.0013
10	699-29-4	9.94E-13	699-29-4	6.96E-06	699-29-4	5.15E-05	Stream Tube Location NE2	4.75E-04	Stream Tube Location E4	0.0014
11	Stream Tube Location SE6	5.80E-11	Stream Tube Location NE2	6.96E-06	699-29-4	6.71E-05	699-29-4	5.13E-04	699-29-4	0.0015
12	699-20-E12O	3.64E-10	Stream Tube Location SE6	1.31E-05	Stream Tube Location SE6	4.02E-04	699-22-35	6.49E-04	Stream Tube Location SE6	0.0016
13	Stream Tube Location NE2	5.32E-10	699-20-E12O	2.18E-05	Stream Tube Location SE6	4.91E-04	Stream Tube Location SE6	0.0012	699-20-E12O	0.0016
14	699-20-E5A	1.12E-08	699-26-15A	4.35E-05	699-20-E12O	7.42E-04	699-20-E12O	0.0013	Stream Tube Location NE2	0.0017
15	699-26-15A	1.81E-08	699-20-E5A	6.30E-05	699-26-15A	7.55E-04	699-20-E5A	0.0016	699-20-E5A	0.0017
16	699-21-6	4.63E-07	699-21-6	2.15E-04	699-21-6	0.0013	699-21-6	0.0020	699-21-6	0.0019
17	Stream Tube Location E1	4.58E-06	699-32-33A	2.71E-04	699-21-6	0.0022	699-26-15A	0.0027	699-20-20	0.0022
18	Stream Tube Location SE2	3.47E-05	Stream Tube Location E1	3.65E-04	699-22-35	699-22-35	Stream Tube Location SE2	0.0032	Stream Tube Location SE2	0.0023
19	699-32-33A	3.90E-05	Stream Tube Location SE2	0.0014	699-32-33A	0.0024	699-20-20	0.0036	699-26-15A	0.0041
20	699-20-20	5.47E-04	699-20-20	0.0040	Stream Tube Location E1	0.0027	699-20-20	0.0036	699-26-15A	0.0041
21	CMAX Stream Tubes	0.0043	699-22-35	0.0085	Stream Tube Location SE2	0.0032	Stream Tube Location E1	0.0051	Stream Tube Location E1	0.0060
22	699-26-35A	0.017	CMAX Stream Tubes	0.012	699-20-20	0.0048	699-32-33A	0.0064	699-32-33A	0.0080
23	699-25-34A	0.022	699-24-34C	0.012	699-24-34C	0.0073	CMAX Stream Tubes	0.0079	CMAX Stream Tubes	0.0096
24	699-25-34B	0.022	699-26-35A	0.013	CMAX Stream Tubes	0.0088	699-24-34C	0.0080	699-24-34C	0.011
25	699-24-34C	0.023	699-25-34A	0.023	699-24-33	0.011	699-24-33	0.0097	699-24-33	0.013
26	699-26-33	0.025	699-25-34B	0.023	699-25-34B	0.022	699-25-34B	0.031	699-25-34A	0.043
27	699-26-34A	0.026	699-26-33	0.028	699-25-34A	0.022	699-25-34A	0.031	699-25-34B	0.043
28	699-32-43	0.038	699-26-34A	0.028	699-26-33	0.027	699-26-33	0.038	699-26-33	0.052
29	699-22-35	0.038	699-24-33	0.028	699-26-34A	0.027	699-26-34A	0.039	699-26-34A	0.054
30	699-34-42	0.041	699-34-42	0.036	CMAX S2	0.034	699-34-42	0.049	699-34-42	0.063
31	699-24-33	0.085	699-32-43	0.037	699-34-42	0.035	CMAX S2	0.049	CMAX S2	0.067
32	CMAX S2	0.15	CMAX S2	0.053	699-32-43	0.037	699-32-43	0.054	699-32-43	0.072
33	CMAX S1b	0.28	CMAX S1b	0.22	CMAX S1b	0.26	CMAX S1b	0.40	CMAX S1b	0.49

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001
 Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Table A-1. 200-PO-1 Operable Unit Predicted Future Concentrations Used for 90th Percentile Calculation for the Far-Field Exposure Area

TCE	SUBAREA	Far Field	SUBAREA	Far Field	SUBAREA	Far Field	SUBAREA	Far Field	SUBAREA	Far Field
	TIME (year)	25 year out	TIME (year)	50 years out	TIME (year)	75 years out	TIME (year)	100 years out	TIME (year)	125 years out
	detects	31	detects	31	detects	30	detects	30	detects	30
	nondetects	2.0	nondetects	2.0	nondetects	3.0	nondetects	3.0	nondetects	3.0
	n (number of values)	33	n (number of values)	33	n (number of values)	33	n (number of values)	33	n (number of values)	33
	p (percentile)	90	p (percentile)	90	p (percentile)	90	p (percentile)	90	p (percentile)	90
	k (position in sequence)	30.6	k (position in sequence)	30.6	k (position in sequence)	30.6	k (position in sequence)	30.6	k (position in sequence)	30.6
	revised mean 90th percentile	0.14	revised mean 90th percentile	0.067	revised mean 90th percentile	0.050	revised mean 90th percentile	0.037	revised mean 90th percentile	0.029
	Cmax	0.81	Cmax	0.36	Cmax	0.24	Cmax	0.17	Cmax	0.11
	excel percentile	0.064	excel percentile	0.028	excel percentile	0.034	excel percentile	0.033	excel percentile	0.022
Rank	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC	Row Labels	Max of CONC
1	699-24-35	0	699-24-35	0	699-23-34A	0	699-23-34A	0	699-23-34A	0
2	699-23-34A	0	699-23-34A	0	699-26-35A	0	699-26-35A	0	699-26-35A	0
3	Stream Tube Location NE6	1.05E-25	Stream Tube Location NE6	7.02E-12	699-24-35	0	699-24-35	0	699-24-35	0
4	699-41-1A	1.81E-23	699-41-1A	4.92E-11	Stream Tube Location NE6	1.88E-07	Stream Tube Location NE6	1.49E-05	Stream Tube Location NE6	1.26E-04
5	Stream Tube Location NE4	5.46E-21	Stream Tube Location NE4	5.80E-10	699-41-1A	4.43E-07	699-41-1A	2.27E-05	699-41-1A	1.58E-04
6	699-35-9	7.74E-18	699-35-9	1.30E-08	Stream Tube Location NE4	1.55E-06	Stream Tube Location NE4	4.47E-05	Stream Tube Location NE4	2.31E-04
7	699-37-4	3.42E-17	699-37-4	2.33E-08	699-35-9	7.65E-06	699-35-9	1.07E-04	699-35-9	3.81E-04
8	Stream Tube Location E5	1.76E-16	Stream Tube Location E5	3.82E-08	699-37-4	1.42E-05	699-37-4	2.30E-04	Stream Tube Location E2	8.03E-04
9	Stream Tube Location E4	7.80E-16	Stream Tube Location E4	6.08E-08	Stream Tube Location E5	1.75E-05	Stream Tube Location E5	2.54E-04	699-37-4	9.52E-04
10	699-29-4	1.04E-14	699-29-4	1.35E-07	Stream Tube Location E4	2.13E-05	Stream Tube Location E4	2.80E-04	Stream Tube Location E5	0.0010
11	Stream Tube Location SE6	4.66E-13	Stream Tube Location SE6	2.60E-06	699-29-4	3.00E-05	699-29-4	3.31E-04	Stream Tube Location E4	0.0011
12	699-20-E12O	5.43E-12	Stream Tube Location NE2	3.27E-06	Stream Tube Location NE2	1.00E-04	Stream Tube Location NE2	3.97E-04	699-29-4	0.0012
13	Stream Tube Location NE2	1.76E-11	699-20-E12O	5.41E-06	Stream Tube Location SE6	3.47E-04	699-32-33A	0.0015	699-32-33A	0.0026
14	699-20-E5A	4.73E-10	699-20-E5A	2.38E-05	699-26-15A	4.71E-04	699-26-15A	0.0017	699-26-15A	0.0033
15	699-26-15A	1.60E-09	699-26-15A	2.40E-05	699-20-E12O	4.73E-04	Stream Tube Location SE6	0.0029	699-22-35	0.0034
16	699-21-6	5.76E-08	699-21-6	1.29E-04	699-20-E5A	9.08E-04	Stream Tube Location E1	0.0030	Stream Tube Location E1	0.0048
17	Stream Tube Location E1	1.63E-06	Stream Tube Location E1	2.79E-04	699-32-33A	0.0010	699-20-E12O	0.0033	699-24-34C	0.0069
18	Stream Tube Location SE2	1.06E-05	699-32-33A	4.97E-04	Stream Tube Location E1	0.0014	699-20-E5A	0.0046	Stream Tube Location SE6	0.0079
19	699-32-33A	2.07E-05	Stream Tube Location SE2	0.0014	699-21-6	0.0020	699-22-35	0.0064	699-20-E12O	0.0085
20	699-20-20	3.16E-04	699-26-35A	0.0022	699-25-34B	0.0053	699-21-6	0.0067	699-25-34B	0.0095
21	699-32-43	5.03E-04	699-26-34A	0.0034	699-25-34A	0.0053	699-25-34A	0.0070	699-25-34A	0.0095
22	699-26-34A	6.88E-04	699-26-33	0.0035	699-26-34A	0.0055	699-25-34B	0.0070	699-20-E5A	0.0100
23	699-26-33	9.82E-04	699-25-34A	0.0040	699-26-33	0.0055	699-26-33	0.0080	699-26-33	0.0111
24	699-26-35A	0.0012	699-25-34B	0.0040	699-34-42	0.0069	699-26-34A	0.0081	699-26-34A	0.0111
25	699-25-34A	0.0020	699-34-42	0.0045	Stream Tube Location SE2	0.0073	699-24-34C	0.0096	699-21-6	0.012
26	699-25-34B	0.0020	699-32-43	0.0046	699-32-43	0.0074	699-34-42	0.0096	699-34-42	0.013
27	699-34-42	0.0023	699-20-20	0.0058	699-22-35	0.013	699-32-43	0.011	699-32-43	0.015
28	CMAX Stream Tubes	0.0052	699-24-34C	0.027	699-20-20	0.014	Stream Tube Location SE2	0.014	Stream Tube Location SE2	0.018
29	699-24-34C	0.041	699-22-35	0.027	699-24-34C	0.015	699-20-20	0.019	699-20-20	0.020
30	699-22-35	0.070	CMAX Stream Tubes	0.028	CMAX Stream Tubes	0.039	699-24-33	0.036	699-24-33	0.022
31	699-24-33	0.20	699-24-33	0.11	699-24-33	0.060	CMAX Stream Tubes	0.038	CMAX Stream Tubes	0.036
32	CMAX S2	0.28	CMAX S2	0.15	CMAX S2	0.090	CMAX S2	0.059	CMAX S2	0.041
33	CMAX S1b	0.81	CMAX S1b	0.36	CMAX S1b	0.24	CMAX S1b	0.17	CMAX S1b	0.11

$$K = \frac{p(n+1)}{100}$$

$$90th\ percentile = \frac{k_{rounddown} + k_{roundup}}{2}$$

reference for K calculation: Hogg and Tanis, *Probability and Statistical Inference*, p. 33, 2001

Percentile Calculation is the nonweighted average of K(rounded down) th and K(rounded up)th values if K is not an integer.

Appendix C

Hand Calculations of the 90th Percentile Value for Iodine-129 and Nitrate

700-0-1 <u>operable unit</u>	Exposure limit Concentration Based on Biological Criteria Concentration of final product standard permissible limit	In loss 1-Apr-1-2010
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Indice 139 90th percentile calculation
at 200 years (Near Field)

$$K = \frac{\rho(n+1)}{T_{\text{co}}} \quad n=22 \\ \rho=90$$

$$K = \frac{10 \cdot 1211}{100} = \frac{10 \cdot 13}{100} = \frac{10 \cdot 10}{100} = 10.1$$

1866 Feb 11 1866 1866 1866 1866

$$K_{\text{calibration}} = 0.59 \frac{\mu\text{g}}{\text{mg}}$$

Frontal app. 1.89 kg

$$\int_0^{11} \mu_{\text{local}}(E) dE = 0.59 + 0.89$$

Level 1
Operable Unit

Exposure Point Concentration
Based on a predicted Future Concentration
Find Value of the Level 1-Operable Unit

$\frac{1}{T_{oper}} \cdot 22720.1 \rightarrow 20$

Nitrate 90th percentile calculation

near-field at 500 years

$$k = \frac{p(n+1)}{T_{500}} \quad n=22 \\ p=90$$

$$k = \frac{90(22+1)}{T_{500}} = \frac{90 \times 23}{T_{500}} = \frac{2070}{T_{500}} \approx 20.7$$

$$90^{\text{th}} \text{ percentile} = \frac{\text{Kranken} + \text{Krankup}}{2}$$

$$\text{Kranken} = 2136 \frac{\mu\text{g}}{\text{L}} \text{ at } 299 - \{12-23\}$$

$$\text{Krankup} = 2718 \frac{\mu\text{g}}{\text{L}} \text{ at } 292 - \{12-25\}$$

$$90^{\text{th}} \text{ percentile value} = \frac{2136 + 2718}{2} = \frac{4854}{2} = 2427 \frac{\mu\text{g}}{\text{L}}$$